Taunton's

Fine WoodWorking

8 tips for flawless moldings, p. 52



How to design beautiful boxes



Best finish for mahogany

Arts & Crafts book rack

Tool test: Forstner bits

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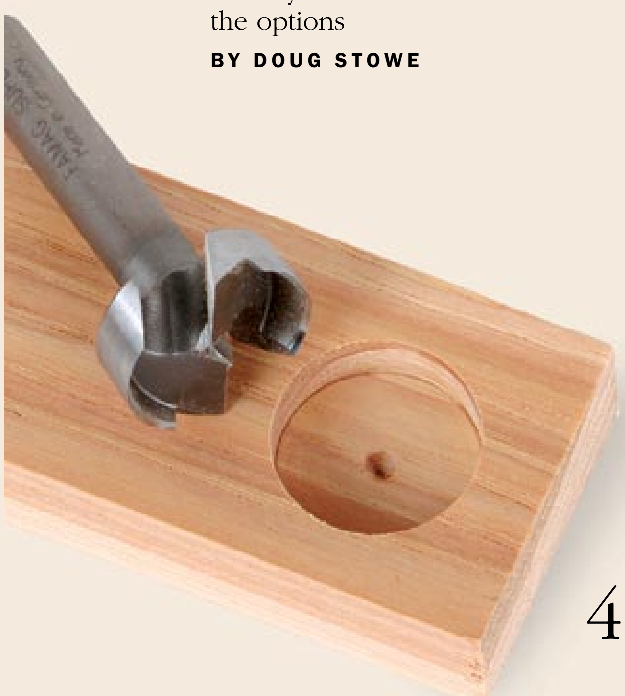
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VIDEOS

Box Making

Watch how Doug Stowe ("Designing Boxes") resaws stock and cuts precise miters with a tablesaw sled. Plus: Read an excerpt from his new book on box making.

Through-Mortises With a Router

See how Gregory Paolini ("A Portable Book Rack") uses a template and routers to cut through-mortises with no tearout.



AUDIO SLIDE SHOW

Pro Portfolio: David Esterly

Take a narrated tour of this master's deep-relief carvings, done in the tradition of Grinling Gibbons.

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Wedding Chest
John P. McCormack, San Francisco, Calif.
PHOTO: LANCE PATTERSON

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VIDEO

Cutting Dovetails

February 13: Web contributing editor Andy Rae demonstrates his foolproof method for laying out and cutting through and half-blind dovetails accurately.



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contributors



Gregory Paolini (*"A Portable Book Rack"*) began woodworking in high school and found that he had an affinity for the Arts and Crafts style. Originally from Buffalo, N.Y., he and his wife moved in 2006 to a small town near Asheville, N.C., which is becoming a center for woodworkers. They had plenty of company on the trip, in the form of their rottweiler, Stu, and almost a dozen ferrets that Paolini calls his "shop assistants." Paolini's home is not far from the Cold Mountain of best-seller and movie fame.



One of Canada's most respected contemporary furniture makers, **Michael Fortune** (*"Tapered Laminations Made Easy"*) has designed and built furniture for clients across the continent for more than 30 years. He recently was commissioned to build a dining table as a gift for the outgoing Governor General of Canada, and she obligingly ordered a set of chairs to go with it.

Harold Greene (*Master Class*) is a longtime furniture designer and maker. From a workshop overlooking the Port of Los Angeles, Greene produces custom pieces with personal touches such as cast hardware. You can see some of his work at www.antiquesofthefuture.net. He also has mastered the Chapman stick, an instrument played by striking rather than plucking the strings.





When a Valentine's Day storm dumped 30 in. on central Vermont in 2007, snowing in managing editor Mark Schofield and **Charles Shackleton** ("*New Twist on a Sleigh Bed*"), Shackleton's famous ancestor came to mind. Sir Ernest Shackleton spent nearly two years (1914-16) marooned in the Antarctic. This time around, though, the survival food was heart-shaped chocolates, not seal blubber.

You might think this is a photo of our editor getting ready to log on to our online forum, Knots, and read comments about the latest issue. In fact, it's **Peter Gedrys** ("*Bring Out the Best in Mahogany*"). In winter, the Connecticut resident spends a couple of hours each week at Yale University's Ingalls Ice Rink stopping slap shots and trying to give as good as he gets.



For more information on our contributors, go to FineWoodworking.com/authors.

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letters

Spotlight

ISSUE NO. 195
Winter 2007/2008
p. 86



SHAPER ARTICLE JUST SKIMMED THE SURFACE

I operate a custom millwork shop, and I applaud your editorial decision to introduce more woodworkers to the shaper. However, as versatile and useful as the shaper is, it is also potentially the most dangerous machine in my shop, and there are a number of procedures shown by Mr. Speetjens that I would not permit.

In the lead photo showing a cove being cut on a curved block, the work will engage the cutter before it hits the bearing. For a deep cut in hard wood (this looks like maple), the work could easily grab and be thrown. I would hold the work in a jig whose lead point can engage the bearing before the cutter engages the work. Exiting the cut is equally dangerous, since the piece is pulled away from the bearing while the cutter is in the wood.

Also, we grind custom knives for shapers on a specialized profile grinder. I don't recommend freehand grinding (p. 87). The cutting circle of the cutterhead, the relief angle, and the precise weight of each knife all affect the geometry of how the knife should be ground. Eyeballing cutters that spin at 6,000 rpm can lead to knives that don't cut, a head that's out of balance, or, worse, a thrown knife.

—PETER LLOYD, president, WoodTech Corp.

J. Speetjens replies: This being a broad introduction to the shaper and not an in-depth guide, we neglected to point out that the cove cut was the culmination of two or three prior passes, which greatly reduced the tendency for the cutter to grab the work (the initial pass can be seen at the top of p. 91). And you'll notice a pin in the table that allowed me to control the workpiece on the way into the cut. That said, you still have a point. While I am comfortable with this approach, it is less than ideal and would have been safer with a template like the one I demonstrated on the bottom of p. 91.

As for custom-grinding knives, it's true that both knives need to be the same in order to achieve a balanced cutterhead and avoid vibration, but I disagree that the only way to achieve this is with a profile grinder. Eyes have a great capacity for accuracy. Pairs of cutters can be checked against a pattern for accuracy, and compared face to face to ensure that the depth and width of details are identical. Also, the length can be checked at various places with calipers.



Custom profiles. *Although there are specialized machines for grinding and balancing custom shaper knives, Speetjens feels comfortable using a bench grinder and working from a template.*

Getting started in woodworking

Thank you for the new, free video series for beginners (www.finewoodworking.com/start). I've been looking for a better way to introduce my son-in-law to woodworking, and the box project is simply great. The video format helps him understand the steps in a logical manner. With one project, he now has some familiarity with jointing and planing, layout and marking, finishing, and many of the basic tools. Better yet, he has an appreciation for what is entailed in producing a fine piece of woodwork.

—MARK SALOMON, Sacramento, Calif.

Starting out with less

Two recent articles covered setting up shop on a budget: the first for $5,000 (*FWW* #188), the second for $2,000 (*FWW* #195). Both of these articles miss the beginning woodworker with no budget at all, only the desire to start.

I began with a bottom-of-the-line tablesaw—all I could afford—which was probably the equivalent of some of today's benchtop saws selling for about $100. It was underpowered and had a miserably inadequate fence, but I made it work for a number of years until I could afford an upgrade.

Over the years I've accumulated a full line of medium-duty tools that, together with quite a number of shopmade jigs and fixtures, do everything I need them to. My point is to advise the beginner to start where he or she can and work up from there, always keeping safety as a priority.

—DAVE BAKER, Halfway, Ore.

Photo: David Heim

Sharpening tablesaw blades

In "A Closer Look: Sharpening Services" (*FWW* #195), the section on table- or radial-arm-saw blades did not mention that sharpening shops do a light peripheral grind to remove side burrs, leaving the kerf slightly thinner by 0.015 in. to 0.025 in. This requires a number of adjustments or replacements of tablesaw accessories, such as the splitter, a box-joint jig, and zero-clearance fences or throat plates, among others.

—SAM SHANMAN, Studio City, Calif.

Design your shop to catch some rays

In "Shop Design: Passive Solar Shop" (*FWW* #195), the author takes winter and summer measurements to check the sun's angle and design his new shop. But there is a way to avoid the story stick and having to make two observations months apart.

The U.S. Naval Observatory has a nice calculator (http://aa.usno.navy.mil/data/docs/AltAz.php) that allows you to pick a date and place to get the altitude (angle above the horizon) and azimuth (angle from true north) of the sun. Then you just draw the angles on clear plastic and place it over drawings to plan the orientation of the foundation, and then the window placement, roof overhangs, etc.

—CHUCK GOOGOOIAN, La Cañada Flintridge, Calif.

Some shop vacs are quiet

In "Silence Your Shop Vac" (*FWW* #195), the author is addressing a problem that only exists because some vacuums are poorly designed. There are a number of very quiet shop vacs on the market.

—LAURENCE PARKER, Brooktondale, N.Y.

Clarification

In the Q&A item "More on Shop Noise" (*FWW* #194), we neglected to explain that sound pressure, which is measured in decibels and is a true measure of danger and potential damage, is different from loudness, which has to do with human perception. So the two machines that each produce 90 db. will indeed produce 93 db. when running at the same time. And while this is only 30% louder, the sound pressure is doubled and the acceptable duration of exposure is divided in half. Nonetheless, a good set of earplugs or earmuffs would reduce the sound to safe levels, as we stated.

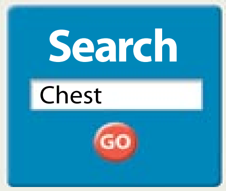
Corrections

In our test of benchtop planers (*FWW* #195), we misstated the number of blades on the Ridgid R4330. There are three.

In Tools & Materials (*FWW* #195) we listed the wrong phone number for Bosch Tools. The toll-free number is 877-267-2499.

About your safety

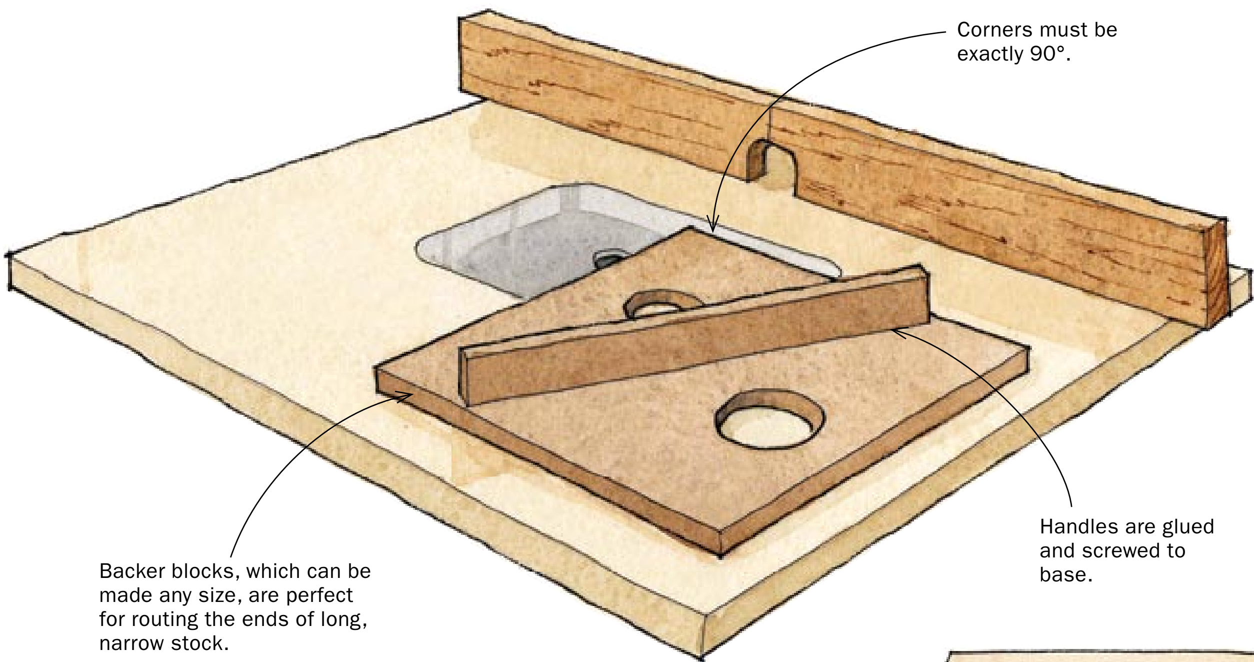
Working wood is inherently dangerous. Using hand or power tools improperly or ignoring standard safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) until you're certain they are safe for you. If something about an operation doesn't feel right, don't do it. Find another way. We want you to enjoy the craft, so please keep safety foremost in your mind whenever you're in the shop.

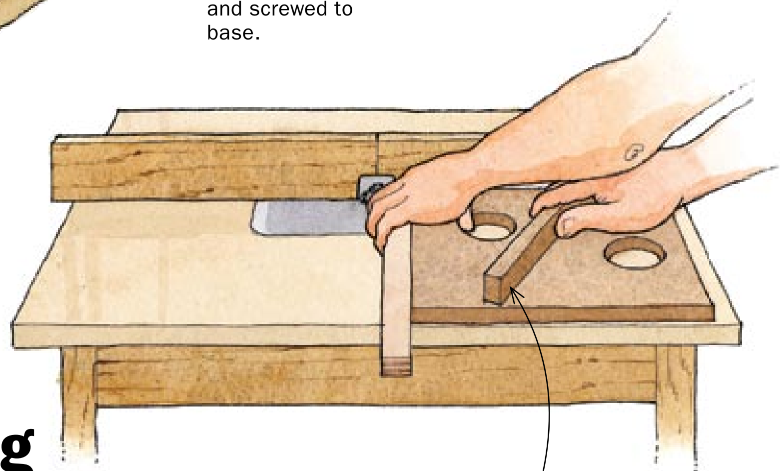




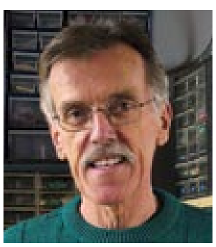
methods of work

EDITED AND DRAWN BY JIM RICHEY





Best Tip



A retired human-resources professional, Serge Duclos spends most of his time pursuing his passion for woodworking. He particularly enjoys designing and building jigs, fixtures, and tools for his basement workshop and has been a steady Methods of Work contributor for several years.

Backer block handles all cross-grain routing

This router-table push block, or backer block as I like to call it, stabilizes the workpiece and reduces tearout. It is handy for backing up the cut across the grain, such as when profiling a panel, but it's especially useful for milling the ends of narrow stock, such as when cutting stub tenons in a frame.

Made of medium-density fiberboard (MDF), it features a skewed handle that's glued and screwed to the base. The handle keeps fingers away from the cutting action and, being skewed, it automatically applies pressure against the fence as you push the workpiece through the cutter. The two finger holes make holding long, thin workpieces much easier.

To use, simply hold the workpiece against the block and push through, keeping the block firmly against the fence. The block can be reversed to make a new zero-clearance backer, and it's easy to replace when it gets worn out.

—SERGE DUCLOS, Delson, Que., Canada

A Reward for the Best Tip

Send original tips to Methods of Work, *Fine Woodworking*, PO Box 5506, Newtown, CT 06470, or email fwmow@taunton.com. If published, we pay $50 for an unillustrated tip; $100 for an illustrated one. The author of the best tip gets a Leigh 18-in. Superjig, with the vacuum/router-support accessory.

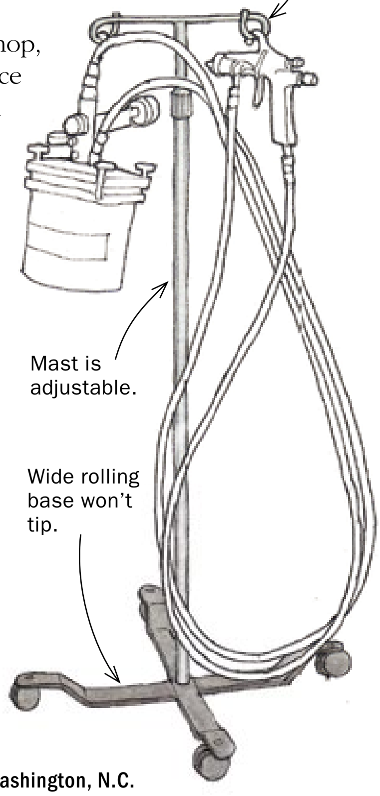


Medical stand is perfect spray-gun holder

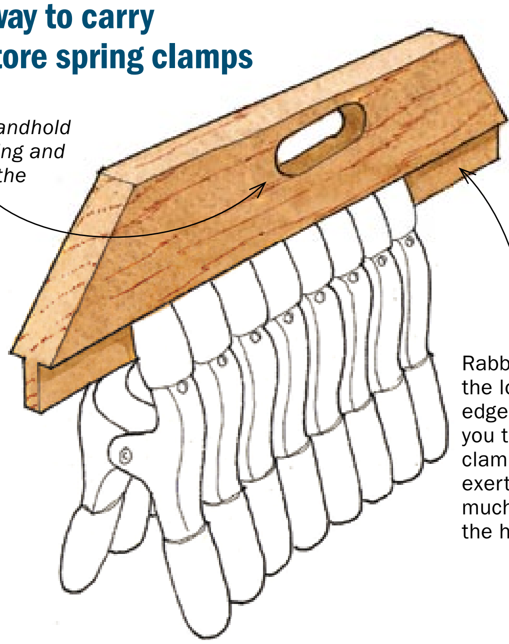
When spraying finish in my shop, I didn't have a convenient place to set my spray gun and small pressure pot. I considered making a custom stand, but then I discovered this chrome-plated, rolling medical IV stand, which I could buy for less than the cost of parts to make one.

The stand has hooks to hold the gun and pressure pot, an adjustable mast, and four casters on a wide base, which makes it very stable. I can roll my spray equipment to where I need it and have a convenient place to hang up my gun and pressure pot. New and used IV stands are available for less than $30 from eBay and other online sales and auctions.

—ALAN SHAFFTER, Washington, N.C.



Easy way to carry and store spring clamps



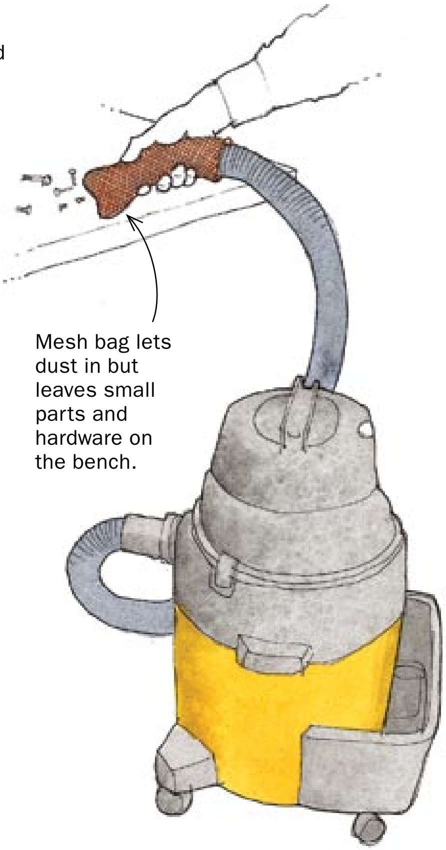
This caddy is one of the best ways to organize a collection of spring clamps. To make it, cut a 1-ft.-long handle, thin the lower edge with opposing rabbets, and pop the clamps onto the caddy. You can carry the clamps from place to place, where they stay neatly out of the way until you need them.

—JACK HEGARTY, Tottenham, Ont., Canada

Mesh-bag vacuum filter keeps small parts on the bench

Horizontal surfaces such as benchtops are great collecting areas, not only for wood dust but also for miscellaneous small parts and hardware, such as screws, that might be needed for a current project. Here's how I solved the problem of vacuuming that dust without devouring the small parts. I put a small mesh bag, the kind used to hold practice tennis balls or used for sweater or lingerie laundry bags (www.handylaundry.com), over the business end of my shop vacuum. The vacuum sucks up the unwanted dust while the mesh keeps out the small parts. It really works well.

—CHRISTOPHER AMAN, Webster, N.Y.



Quick Tip

My saber-saw blades were always rattling around in the tool case and dinging their edges. I found that the blades fit into a compact-disc jewel case perfectly so they sit all in one level and are easy to see. I can tuck the case into my tool bag or the saw case for easy access.

—ERIK ANDERSON, Salem, Ore.

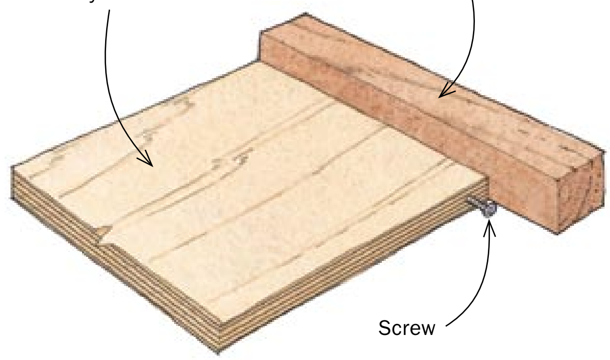
Simple, precise tapering jig

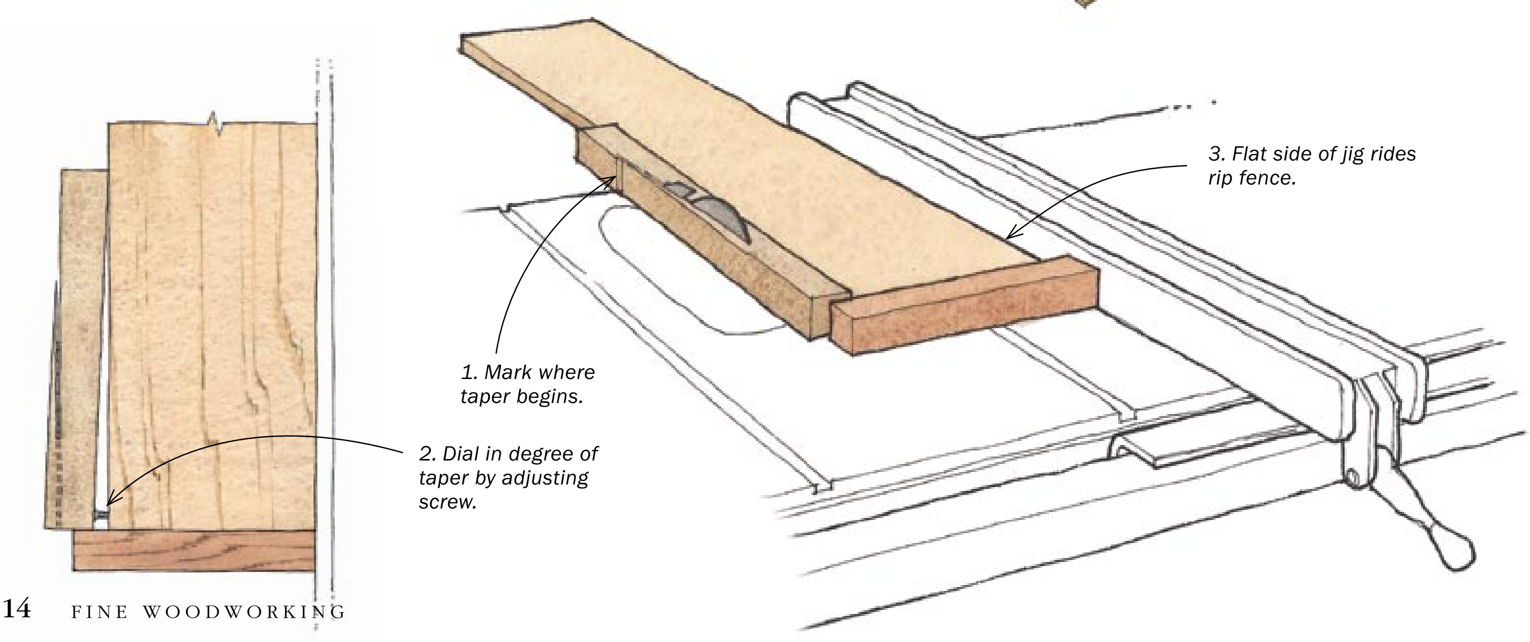
This tapering jig starts with a base of ¾-in.-thick plywood, about 8 in. wide by 5 ft. long. Attach a 1½-in.-sq. by 10-in.-long stop to one end. Then install a flathead screw in the plywood base ½ in. from the stop.

To use, mark where you want the taper to start on the workpiece and determine the amount of taper you need. If you want a ½-in. taper, for example, unscrew the screw ½ in. Place the jig against the rip fence with the bottom of the leg against the stop and the screw. Slide the rip fence over until the blade just touches the mark where you want to start the cut.

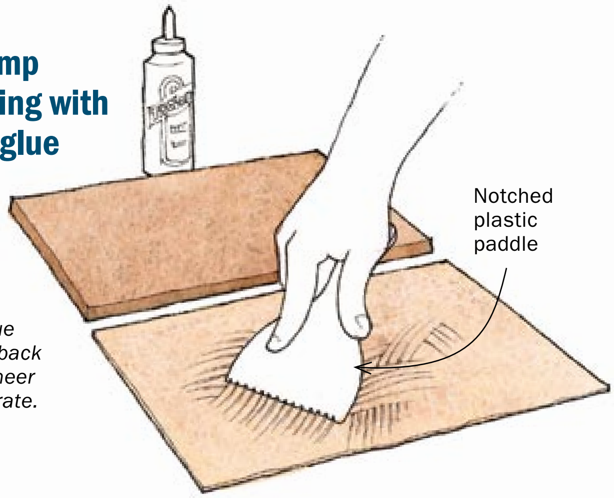
The 5-ft.-long jig gives you plenty of support against the rip fence, plus it will handle legs of virtually any length.

—DAVID SUTTER, Wilbraham, Mass.





No-clamp veneering with yellow glue



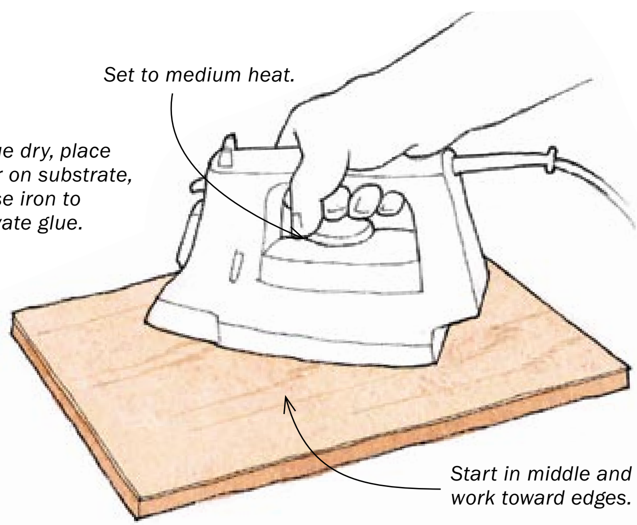
I was making an end table and wanted to use a nice piece of walnut veneer on the top. Unfortunately, the substrate was too big to use a sandwich-and-clamp method, and I did not want to buy a veneer press for one job. A friend, Neil Artman, told me about a method that doesn't require clamps or a press.

First, I bought a plastic paddle, the kind used to spread drywall mud, and cut kerfs into it about ⅛ in. deep and ¼ in. apart. I then sprayed the show side of the veneer with water. I flipped it over and used the paddle to spread a liberal, even amount of Titebond Original Wood Glue on the other side of the veneer, being sure to cover the edges. As the glue soaked in, the veneer started to flatten out. Next, I spread an even layer of glue on the substrate with my altered paddle.

At this point, I let both the glue on the substrate and the veneer dry separately for at least an hour. Once the glue dried, I carefully placed the veneer (glue side down) on the glue side of the substrate. Once I had it in position, I used an iron set to medium heat to reactivate the glue and adhere the veneer to the substrate. I started in the middle and worked toward the edges to cover the entire veneer. I first tried this on a sample piece and was shocked at how well it worked.

—CHAD HUSTING, Mason, Ohio

Editor's note: Although the process worked well with Titebond Original, a customer-service representative at Titebond says Titebond II will work better because it tends to have better grab and provides more strength in the wet form.



Durable carbide scraper reaches tight spots

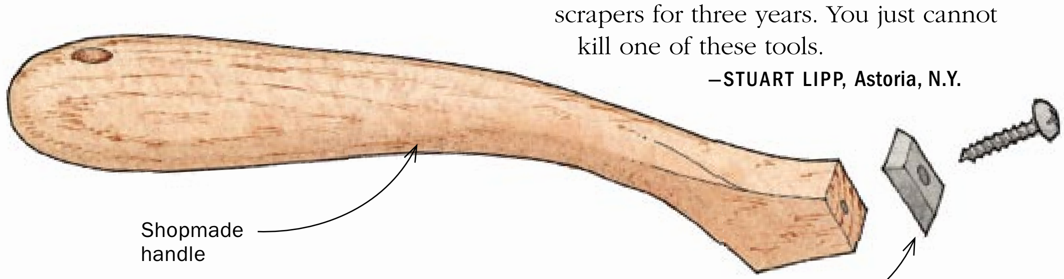
I make scrapers using ¾-in.-sq. carbide inserts for machining metal. These scrapers excel in corner and edge work because the scraper head is small enough to get into tight areas.

The solid carbide is sharp, long-lasting, and maintenance-free. These carbide inserts, which come in different shapes and sizes, have a predrilled mounting hole and feature four separate sharp sides on the same blade. Carbide Depot (www.carbidedepot.com) is one source.

Screw a blade to a homemade handle and you're ready to scrape. Angle or skew the blade if you wish. Although sharpening a dull carbide blade is next to impossible unless you have the right diamond hones, one carbide cutting edge will last a long time if you are scraping only wood and wood glue. Steel scrapers, on the other hand, constantly need tuning up.

I've been using the same four-sided carbide insert blade in one of my scrapers for three years. You just cannot kill one of these tools.

—STUART LIPP, Astoria, N.Y.



Quick Tip

I buy PVA glue by the gallon and pour it into reusable plastic squeeze bottles. But the squeeze-bottle cap is often difficult to remove due to buildup of glue in the threads. To solve this problem, I clean the threaded portion of the cap and bottle with water, dry, and then apply a bit of paste wax to the threads of both the cap and bottle. Now I'm able to unscrew the cap with hand pressure alone, every time.

—MAX PETERSON, Bethel Park, Pa.

Forrest Blades

Ideal for High-End Kitchens and Baths

For almost 60 years, experienced woodworkers have relied on Forrest for the very finest in precision-engineered saw blades.

Kitchen and bath remodelers especially appreciate the smooth, quiet cuts that Forrest blades deliver–without splintering, scratching, or tearouts. In fact, independent tests rate Forrest blades as #1 for rip cuts and crosscuts. So they are perfect for cabinets, countertops, and flooring.

Forrest blades and dados owe their superior performance to a proprietary manufacturing process, hand straightening, and a unique grade of C-4 micro-grain carbide. Nobody beats these American-made blades for quality or value.



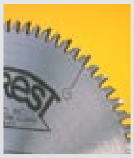
"Your blades are without question the best by miles, and I have tried them all."

Bob Jensen–Fridley, MN

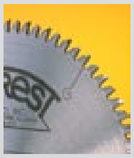
"From the first cut on, I realized that this blade was a bargain at any price! Nothing else I have cuts comparably."

Calvin Brodie–Spanaway, WA

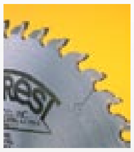
Forrest has over 12 blades designed for serious woodworkers. **These blades are especially useful for high-end remodeling:**



Duraline – Available in several tooth count/style combinations for flawless cutting of laminates, acrylics, wood, and more.



Duraline Hi-AT – Best for cutting two-sided veneers and low pressure laminates without chip-outs or splintering.



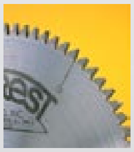
Solid Surface Planer – For super-smooth cutting of solid surface countertops without scratches or long finishing times.



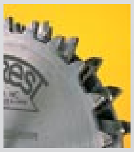
Woodworker II – *The* best-rated all-purpose blade for excellent rips and crosscuts on all hard and softwoods.



Custom Woodworker II – A specialty blade that's ideal for box joints, dovetails, flat bottom grooves, and high feed rates.



Chop Master – For tight, perfectly cut miter joints and smooth cross cutting at any angle.



Dado King – The finest multi-tooth set for making flat-bottom grooves without splintering across *and* with the grain.

It's Easy to Order

All Forrest blades come with a 30-day, money back guarantee. So order today in any of these convenient ways:

- **Visit one of our fine-quality dealers or retailers.**
- **Call us toll free at 1-800-733-7111.** (In NJ, 973-473-5236) Ask about special discounts, free shipping on orders over $275, and discounts for blade sharpening.
- **Visit our website:** www.ForrestBlades.com

FORREST

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* As seen in Fine Woodworking's 2004 Tool Guide, pg.121.

Woodworker II	Woodworker II	Woodworker II	Chop Master	Dado King	Dado King	Duraline Hi-AT	Custom Woodworker II
Fine Woodworking*	Wood Magazine	Woodshop News	Woodshop News	Wood Magazine	Woodshop News	Woodshop News	Woodshop News
BEST OVERALL	TOP TOOL	2007	2007	TOP TOOL	2007	2007	2007

tools & materials



Brutal test. *To test the rebuilt batteries, we used a spade bit to drill 1¼-in.-deep holes into white oak.*

DOVETAIL JIGS



Dovetail cutter. *The Leigh Super Jig comes in three lengths; 12 in., 18 in. (shown with optional VRS vacuum and router support), and 24 in.*

New Leigh jigs offer great value



Adjustable tails and pins. *Sliding fingers allow users to create any dovetail spacing. A square-drive screwdriver (supplied) secures them.*

Online Extra

To post ratings and reviews of the tools you own and to browse our free archive of tool reviews from the last five years of *Fine Woodworking* magazine, go to **FineWoodworking.com/ToolGuide.**

LEIGH INDUSTRIES RECENTLY RELEASED a new series of dovetail jigs. The Leigh Super Jigs are available in three sizes: 12 in., 18 in., and 24 in. The size represents the maximum board width they can accommodate.

The jigs are similar to Leigh's flagship D4R model, but their construction has been changed to make them available at a lower price.

I tested the 18-in. model to evaluate its performance. The dovetail spacing and the width of the tail are fully adjustable. However, a one-piece finger assembly (unlike the two-piece assembly on the D4R) means all pins must be the same width.

When it comes to cutting half-blind dovetails, Leigh took a new approach here. Like the D4R, these jigs can cut half-blind dovetails with variable spacing, but Leigh also adopted the more common and faster procedure of cutting equally spaced dovetails in both the tail and pin boards in the same operation.

The Super Jigs accept stock up to 13/16 in. thick for through-dovetails, 1 in. thick for half-blind, while the D4R accepts 1¼ in. thick and 1½ in. thick respectively.

All things considered, the Super Jig cut through-dovetails and half-blind dovetails as well as the D4R, and it was easier to set up. If you can live without the variable-width-pin feature of the $490 D4R, I suggest you take some pressure off your wallet and buy a Super Jig. The Super 18 sells for $260, the 12-in. model for $220, and the 24-in. for $330. For information, go to www.leighjigs.com.

—Tim Albers works wood in Ventura, Calif.

CORDLESS TOOLS

Rebuilt batteries cheaper than new

I WAS SKEPTICAL ABOUT REBUILT cordless-tool batteries. However, since the two 12-volt batteries that came with my 10-year old Porter-Cable drill couldn't hold a charge anymore, I didn't have much to lose.

I sent one battery each to two companies that put replacement cells into old battery packs. Both Primecell (www.primecell.com) and Voltman Batteries (www.voltmanbatteries.com) charged $40, including shipping and handling.

To make it a three-way comparison, I bought a new 12-volt Porter-Cable battery for $56, the lowest price I could find. After charging and discharging each battery three times to condition them, I tested them using a new 1-in.-dia. spade bit for each battery.

The rebuilt Voltman battery ran out of juice after 8¼ holes, the new Porter-Cable battery lasted 8½ holes, while the Primecell rebuilt battery went for 9½ holes.

If you have an old tool whose battery has died, and you're put off by the cost of a new battery or one is no longer available, this is a cheaper way to get the tool back to work.

—Mark Schofield is the managing editor.



Better than new. *Rebuilt batteries typically cost less than new ones and perform just as well.*

Photos, except where noted: Staff

■ HAND TOOLS

Quick rabbets and grooves



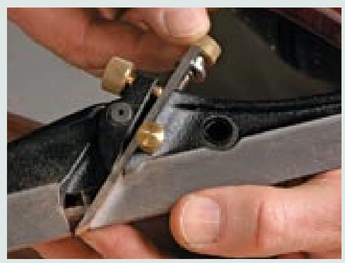
New plow plane is easy to adjust. Long before you'd have a router or tablesaw set up to cut a dado, groove, or rabbet, you'd have the job done with this new version of a classic tool. It comes with a 1/4-in. A2-steel blade, with 1/8-in., 3/16-in., 5/16-in., and 3/8-in. blades available separately.

VERITAS HAS INTRODUCED a small plow plane that is ideal for plowing grooves up to 3/8 in. wide in drawer sides, door frames, and cabinet backs. It also can cut rabbets up to 3/8 in. wide for shiplap joinery or for preparing a flat panel for insertion into a grooved framework.

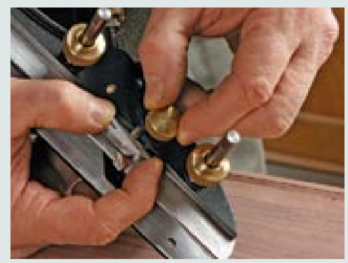
I've used several plow and combination planes over the years. Often they are a bit finicky and require time to set up. This is not the case with the Veritas plow plane—it was ready to use right out of the box. A minute spent honing a microbevel on the blade made things even better. It takes a minute or less to install and set the blade, and less than a minute more to set the fence position and depth of cut. The whole process is quicker than setting up a router or a tablesaw with a dado blade.

I used the plane on walnut and cherry, plowing grooves in a range of sizes and rabbets with and across the grain. (Cross-grain rabbets must be scored first with a marking gauge.) In all cases, the plane performed flawlessly. Granted, if you have a mountain of grooves to cut, a router or tablesaw will do the job more quickly. But if you have just a small batch of grooves, the ease of setup and use make this small plow plane a practical option. The plane sells for about $200 with the 1/4-in. blade. Go to www.leevalley .com for more information.

—Chris Gochnour builds furniture in Murray, Utah.



Blade adjustment. Adjusting the blade depth is simply a matter of turning a knob.



Depth stop. Thanks to spring tension, the stop stays put when you release the lock knob.



■ MACHINES

Portable saw fits the bill in a small woodworking shop

I HAVE A TINY SHOP. Indeed, in good weather I often move tools outside to gain some elbow room. That's why the new Bosch 4100DG-09 portable tablesaw caught my eye.

The 15-amp universal motor ran relatively quietly with little vibration. It cut briskly through 3/4-in.-thick plywood, showing no sign of bogging down. To my surprise, it handled 1 3/4-in.-thick hard maple almost as easily.

The blade is easy to tilt, once you unlock a sticky, somewhat clunky blade-lock lever. Blade changes are a snap with a lift-up arbor lock and an arbor wrench.

Bosch designed a Smart Guard System on the saw, which incorporates three safety systems—a blade guard, anti-kickback pawls, and a riving knife. The three features are easily removable and can be used independently or in combination.

The 4100DG-09 has a maximum blade height of 3 in. and a 25-in. rip capacity. It sells for around $680. For more information, go to www.boschtools.com or call 877-267-2499.

—Anissa Kapsales is an assistant editor.



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Smooth cutter. *Unlike a typical two-cutter router bit, the new four-cutter Quadra-Cut from Freud produced no visible end-grain tearout.*

■ BLADES AND BITS

New router-bit design makes clean cuts

FREUD RECENTLY INTRODUCED A NEW LINE of uniquely designed router bits called Quadra-Cut. Unlike typical bits, which have two cutters, Quadra-Cut bits have four.

Two of the cutters work like those on any other bit, skewed forward to slice downward while cutting the profile. The extra pair, however, are shorter and cut only along the lower edge of the profile. And they skew backward to cut upward.

Effectively, the two pairs work as a team; with two cutting down from the top surface of the stock, and two cutting up from the bottom. The idea is to reduce tearout on both the top and bottom faces.

To find out if the concept worked, I used a router table to test a Quadra-Cut ½-in.-radius roundover bit against Freud's regular ½-in.-radius roundover bit. Both bits were brand new and had ½-in.-dia. shanks. To use the entire profile, I cut a stepped roundover. I used poplar and walnut, making both long-grain and end-grain cuts in each.

On long grain, both cutters made very good cuts. Tearout was nonexistent. Washboarding (chatter) was minimal and only visible when a bright light was raked across the surface. I judged the Quadra-Cut bit as the better of the two by only the slightest of margins.

However, on end grain, the Quadra-Cut bit really showed its advantage. While the standard bit made very good cuts, the Quadra-Cut made better ones. Indeed, along the entire surface of the ½-in.-radius curve, the Quadra-Cut showed no significant tearout or washboarding. At the step, when compared to the standard bit, the Quadra-Cut made an exceptionally clean cut.

You may still need to do some sanding to get perfectly smooth moldings. But a Quadra-Cut bit can reduce sanding time to a minimum.

Currently Freud offers Quadra-Cut bits in about a dozen profiles, with more to come. To get more information, go to www.freudtools.com or call 800-334-4107.

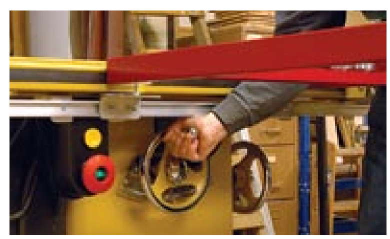
—Tom Begnal is an associate editor.



Plywood support. *Cutting full sheets of plywood is a lot easier with table extensions from Ezee-Feed. They remove in seconds for flat storage.*

■ ACCESSORIES

Tablesaw extensions



Knuckle whacker. *On some saws, like this Powermatic, the Ezee-Feed T-track leaves little room to comfortably turn the elevation crank.*

I WORK ALONE AND MY SHOP IS SMALL, so it's a chore to muscle a 4-ft. by 8-ft. sheet of plywood or MDF onto my tablesaw. Recently, I tried infeed and outfeed tables from Ezee-Feed Manufacturing. They made the task a lot easier.

The tables, sold separately, are sturdily constructed of tube-and-channel steel, they can be added or removed in seconds, and the folding legs make them easier to store.

On the downside, the outfeed table only has enough rollers to adequately support one offcut, not both. So if I centered the table with the sawblade, only one row of closely spaced rollers was given the task of supporting each offcut. If I offset the table to one side or the other, then I was supporting only one part of the offcut. Ideally, I'd want two outfeed tables, side by side. But if you already have a wide outfeed table, the infeed extension would be an excellent option for those times you are handling large sheets.

The tables are sold in two lengths: 40 in. and 58 in. Infeed tables are priced at $310 and $330 respectively; outfeed tables sell for $270 and $290. For more information, go to www.ezee-feed.com or call 267-784-9600.

—Contributing editor Roland Johnson lives in Sauk Rapids, Minn.

Photos, this page (bottom two): Roland Johnson



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what's the difference?

Bevel-up vs. bevel-down planes

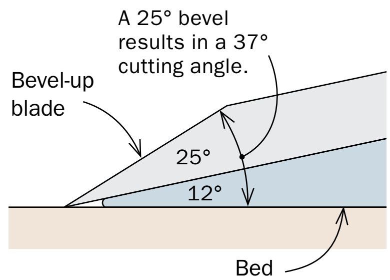
BY JOHN LEKO



The tip of a plane iron or blade is beveled on only one face, and handplanes can be classified based on whether the blade is mounted with the bevel facing up or down. Until recently, bevel-down planes were the rule. Only small block planes were bevel-up. Now, a variety of bench planes have this bevel-up configuration, which makes them more versatile. Here's why: In a bevel-down plane, the blade (along with a chipbreaker, which attaches to it) rests on a frog—typically, a 45° bed screwed to the plane body. Because the bevel is behind the edge, the cutting angle is fixed at 45°. That's a good angle for most tasks, but not for end grain or grain prone to tearout.

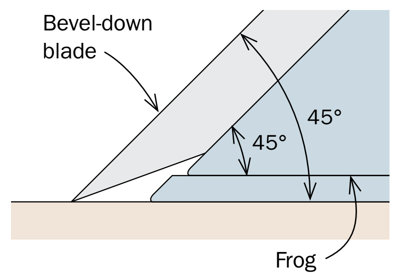
In a bevel-up plane, the bevel leads into the cut, contributing to the cutting angle. The bed is molded into the plane body at a low angle, usually 12°. So a bevel-up plane with an iron ground to 25° has an effective cutting angle of 37°.

BEVEL-UP PLANE



The cutting angle is determined by the bed angle and the bevel angle.

BEVEL-DOWN PLANE



The cutting angle is determined by the frog angle.

However, you can change that angle easily—by changing blades or grinding a new bevel angle on the existing blade.

This versatility makes bevel-up planes especially handy for working a variety of woods and/or grains. You can make the angle low for end grain and softer woods, steep for difficult grain in dense or highly figured woods, or medium for everything else. (See A Closer Look, "Handplane blade angles," *FWW* #186.)

All in all, bevel-up planes are more "woodworker friendly." With fewer parts—no frogs or chipbreakers as on bevel-down planes—they are easier to set up and maintain. Their adjustable throat plates quickly set to the desired mouth opening to support the wood fibers and prevent tearout. (On bevel-down planes, you need to move the frog forward or back to change the mouth opening, a longer and trickier operation.) In short, their ability to work any grain situation makes bevel-up planes more versatile. ☐

—John Leko is a furniture maker in Huntsville, Ala.

BEVEL-UP PLANE



A low-angle for end grain. *This bevel-up plane is equipped with a blade beveled at 25° on a 12° bed, for a cutting angle of 37°.*



Steeper angle for tougher grain. *The same plane with a 38° blade provides a 50° cutting angle for this tiger-maple board.*

BEVEL-DOWN PLANE



A good angle for general use. *The 45° cutting angle of a standard plane makes fast work of surfacing this poplar board.*

Photos: Charlie Reina; drawings: Michael Pekovich

Are you getting the most from your combo square?

BY PHILIP C. LOWE

Telling new woodworkers about the combination square is a little like being the announcer in those old commercials for the Ronco Veg-O-Matic. No, the square won't slice and it won't dice, but it *will* excel at so many woodworking jobs that it's tempting to say "But wait! There's more!"

A good combination square (Starrett or Brown & Sharpe brands are recommended—see a review in *FWW* #159) can serve as a machinist's square, a straightedge, an adjustable try square, a miter square, a marking gauge, a depth gauge, and a ruler. You'll use it to set up shop machines, to true workpieces, and to lay out and perfect joinery. In short, if you're starting out and looking for a basic tool that will help you improve your woodworking, the

Machine setup



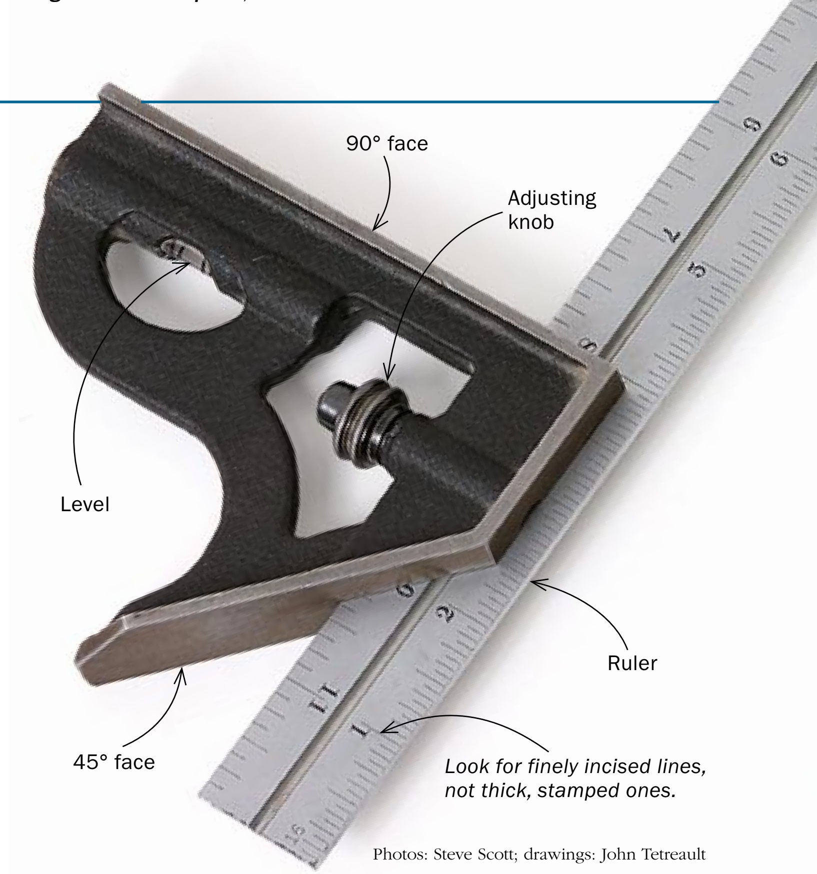
The right angle. *The combination square can be used in a variety of ways to set up shop machines for 90° cuts. Here, Lowe uses it to set a tablesaw blade at a right angle to the table. Be sure the ruler is against the saw plate, not a tooth.*

DON'T BE AFRAID TO TAKE IT APART





Some reassembly required. *Because the ruler is graduated differently on each edge, you will sometimes want to remove and reorient it for easier measuring. The mounting post inside the square (left) is machined to fit inside the slot in the ruler. To insert the ruler (above), push on the spring-loaded nut and turn the post until it aligns with the slot. Then slide the ruler into place.*



Photos: Steve Scott; drawings: John Tetreault



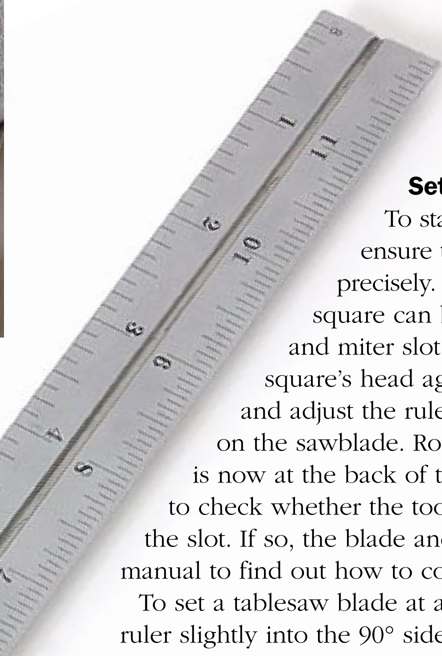
Check sawblade and miter slot for parallel. *Use the inside edge of the miter slot as a reference surface and adjust the table if necessary.*



Setting up for square crosscuts. *Hold the combination square with its head against the miter gauge. Adjust the gauge until the square's ruler rests flush against the side of the sawblade. This ensures a 90° crosscut.*



Putting the miter in miter gauge. *Use just the head of the combination square to set a miter gauge for an accurate 45° cut.*



combination square is what those old ads called an "amazing offer."

Set up machines accurately

To start, a combination square will help ensure that your shop machines are set up precisely. On the tablesaw, for example, the square can be used to check that the sawblade and miter slot are parallel to each other. Set the square's head against the inside edge of the miter slot and adjust the ruler until it touches one of the front teeth on the sawblade. Rotate the sawblade so the same tooth is now at the back of the throat opening, and use the square to check whether the tooth is still at the same distance from the slot. If so, the blade and slot are parallel. If not, check the manual to find out how to correct this problem on your saw.

To set a tablesaw blade at a right angle to the table, recess the ruler slightly into the 90° side of the head. Place the head flat on the table so the ruler is standing vertically beside the sawblade. Now adjust the sawblade until there is no light between it and the ruler's edge. Lock down the blade. This also works to set a jointer fence at 90°.

A miter gauge won't deliver square crosscuts if its fence is not at 90° to the blade. To adjust it accurately, hold the combination square with its head against the fence of the gauge. Adjust the gauge until the square's ruler rests flush against the side of the sawblade.

The square can be used as a height gauge for adjusting the height of sawblades or router bits. Adjust the ruler in the head to the desired dimension. Then hold the end of the ruler against the table or router base and raise the blade or bit until it touches the head without lifting the ruler off the table.

The design allows precise layout

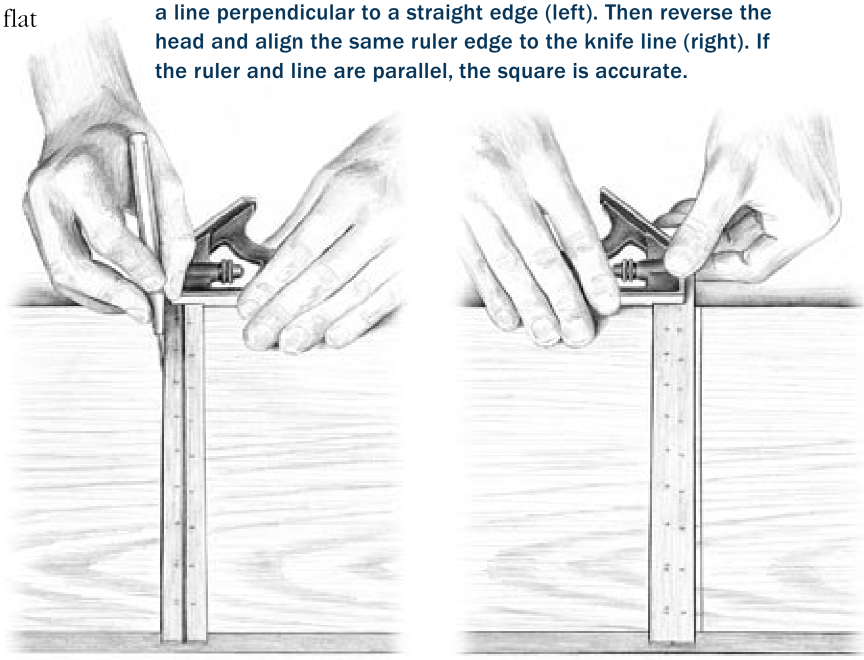
This square is also a highly useful layout tool. The flat edge milled onto a combination square's thick head acts



An adjustable height gauge. *Set the head at the desired measurement. Hold the end of the ruler flat against the router's base and raise the bit until it touches the head without lifting the ruler.*

HOW SQUARE IS YOUR SQUARE?

To check a square's accuracy, extend the ruler fully and score a line perpendicular to a straight edge (left). Then reverse the head and align the same ruler edge to the knife line (right). If the ruler and line are parallel, the square is accurate.



Layout



An etched ruler enhances accuracy. *The fine lines on a quality square are etched into the ruler, so the tip of a marking knife can be registered inside them.*



Laying out dadoes. *A square with a long ruler is great for laying out dadoes across a wide panel.*



Laying out a miter. *The 45° head makes it simple to lay out for a miter cut. Finger holes help the user hold the square tightly against the stock.*



Like a marking gauge with a built-in ruler. *The combination square allows marking parallel to an edge at adjustable distances.*

as a fence, holding the ruler perpendicular to any reference surface. To score an accurate line, hold the head tight against the reference surface and use the ruler's edge as a guide for your pencil or marking knife.

If you have the 24-in. and 36-in. rulers, you can mark the locations of dadoes from the end of a board and transfer the same locations to a mating piece. And because the ruler is adjustable, the square can be used as a marking gauge, striking parallel lines at varying distances from the reference surface. An example is when you need to lay out a mortise in the middle of a board, farther away than a marking gauge will reach.

To do so, adjust the ruler so that its end rests at the correct distance. Now hold a pencil to the work at the ruler's end and slide the square's head along the reference surface, keeping the pencil against the ruler's end as it moves.

A similar technique can be used to transfer a layout from one workpiece to another; for example, marking drawer fronts for hardware locations. Once you've marked the location of the outer post or center for a knob, the square can be adjusted and locked in position and the same position can be marked on each drawer.

Perfecting workpieces or joinery

One of the square's most important uses is checking that the edges and ends of workpieces are square. When doing so, hold the head of the square firmly against the reference surface and slowly lower the ruler to contact the highest point of the edge being checked.

The square is also useful for checking a workpiece for 45°. Most miters make up 90° corners and a quick check holding the outside of the head of the square can show where material may need to be taken away to form the perfect 90°.

The square's adjustable ruler lets you check a workpiece for consistent thickness. Start at one corner of the piece and hold the

Joinery





Checking for square and the trueness of a miter. *First, set the head of the square against the reference surface, then lower it until the ruler touches the highest point (left). Face a light source and look for a gap under the ruler.*



A thickness gauge. *Adjust the ruler to match the thickness in one corner, then compare at the other three to see if the stock is consistently thick. Your fingertip will feel the slightest difference.*

head of the square against a face. Adjust the ruler to match the thickness of the stock. Then use this setting to check the other corners—if the ruler protrudes beyond or is shy of the opposite surface on any of these corners, the thickness is not consistent.

A variation on the technique for gauging stock thickness allows you to check the depth of a mortise. Start by adjusting the ruler to the desired depth. Insert the ruler into the mortise; if the square's head doesn't touch the surface, the mortise is too shallow. The square also can help check the end walls of a mortise for square. Slide the edge of the ruler against the end wall. If there is a void between the ruler and the top edge of the mortise, it indicates the mortise is not square.

Tenon cheeks can be checked to make sure they are parallel with the face of the workpiece by placing the head of the square against the surfaces and extending the ruler to touch the cheek of the tenon. Since the end of the ruler is ground square to the edge, being able to view light under it will indicate how parallel the cheek is to the surface. □





Check mortises and tenons. *Adjust the ruler to the desired depth and set it into the mortise (left); if the head doesn't touch the surface, the mortise is too shallow. A square can also help check whether tenon cheeks are parallel to the face of the workpiece (right).*



READER SERVICE NO. 127

a closer look



Hide glue

AGE-OLD TECHNOLOGY HAS UNMATCHED ADVANTAGES

B Y W . P A T R I C K E D W A R D S

The right stuff. *Solid at room temperature, with a very long shelf life, hide glue is sold in granules and pearls. Edwards recommends the granulated type, made in the United States.*

If you were lucky enough to learn woodworking from your grandfather, he would have patiently shown you which end of a handplane is the front, the right way to use a chisel (not for opening paint cans), and how to cook glue. Unfortunately, the traditional glue pot disappeared from woodshops and trade schools soon after World War I when synthetic adhesives took over, leaving later generations of woodworkers to learn this secret of the craft on their own.

Hot animal-protein glues have many advantages over synthetics. They are very quick-setting; transparent to stains, oils, and other finishes; easy to clean up; and reversible, making repairs possible. They are also organic in nature, and are not toxic to humans or pets.

If you doubt the strength of animal glue, check out the recent test in *FWW* #192 ("How Strong Is Your Glue?"), where hide glue stood shoulder-to-shoulder with yellow glues and epoxies. And of course, witness the host of antique furniture that has survived for hundreds of years.

All wood glues create a mechanical bond by penetrating the porous surface and solidifying there. But animal glues also create a strong molecular bond with wood (and other animal glues), due to the attraction between certain molecules and atoms.

The glue sets initially by losing heat, and then cures fully by losing moisture. As mentioned earlier, this process is always reversible, and can be repeated even after a century or more.

The right animal glue for you

Although there are many excellent organic glues—from fish, milk protein, rabbit skin, horse bone and hide, and vegetable compounds—I'll focus on hide glue, the most versatile type for furniture making. Today, hide glues are sold either in pearl or granulated form; I recommend only the latter, which turns to gel very quickly when cold water is added.

Hide glue can vary in quality, and it can go bad if exposed to moisture. Some people have sworn off hide glue after buying

Host of uses for hot glue

No other glue has hide glue's quick tack, easy cleanup, and transparency to stains and clear finishes. You can apply veneer (left), rub on glue blocks (below), and apply inlay (right) in minutes and with no clamps.







Photos: Asa Christiana





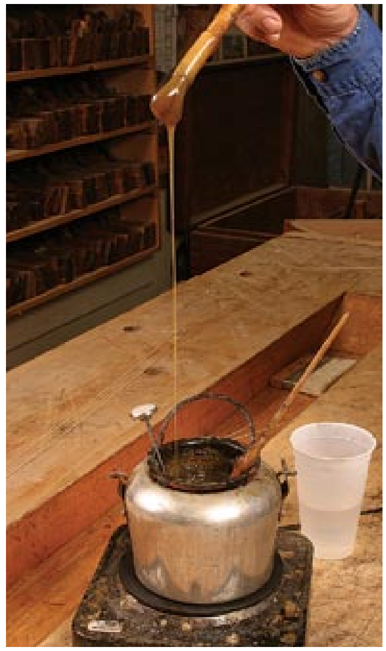
Simple recipe for success

Edwards' setup is a double-boiler glue pot with a meat thermometer and natural-bristle glue brushes inside. Unless you reheat your glue every day, just cook up a fresh batch when you need it.





No measuring necessary. *Add just enough cold water to cover the granules. You'll have gel in about an hour (left).*





Two tests. *Hot glue loses moisture as it cooks, so check the viscosity from time to time. A brush should trail a long, even stream of glue (left), up to a foot long before it breaks into droplets. If not, stir in some hot water. To be sure you have good glue, or to see if old glue needs replacing, try a little hot glue between your finger and thumb. The glue should begin to get tacky and make long strands as it cools (right).*

poorly made or poorly stored animal glue from indiscriminate sources all around the world, and then experiencing joint failures. Others complain about the smell. Good-quality glue has a very mild animal odor. If it smells rancid, it is bad and should be thrown out.

Milligan & Higgins is the only American company still making these glues. Because they make the glue themselves, they can guarantee its formulation and strength. Also, their glue's quality is controlled by the Food and Drug Administration.

Glues are graded according to a pressure test that is measured in grams. The lower strengths are more flexible and have longer open times, while the higher strengths are more rigid and set up very quickly. I recommend Milligan & Higgins 192-gram hide glue for all furniture-making tasks; I've been using it for 40 years. It actually is a mix of bone and hide glues, and has an open time of 1 or 2 minutes at normal room temperature and humidity levels, setting up as it cools. You can order hobbyist quantities of Milligan & Higgins 192 from Tools for Working Wood (www.toolsforworkingwood.com;

Put off by the pot? Try liquid hide glue

Edwards produces a urea-modified hide glue, called Old Brown Glue (http://wpatrickedwards.com/gluepage.htm), which is liquid at room temperature and has a longer open time than yellow glue.



All-purpose glue. *For standard woodworking tasks like this panel glue-up, liquid hide glue allows plenty of assembly time. It still needs to be warmed a bit to thin it out, but a simple bath of hot tap water does the trick.*



Hammer veneering is quick and easy

Hide glue lets you press beautiful veneers onto almost any flat or curved surface in minutes without clamps or cauls. The veneer hammer is used like a squeegee. Move very quickly, as the glue starts to set up after a minute or two.



__To move fast, work smart.__ Brush glue onto the substrate (right), then lay the veneer on top of it, glue side up. This keeps the substrate warm and puts some glue onto the veneer's show face. Now brush glue quickly onto the veneer before flipping it over (top right).





__How to "hammer."__ There will be enough glue residue on the top side to lubricate the hammer. Start from the center, locking that down first so the veneer stays put as you begin to push (or pull) the excess glue to the outside.

800-426-4613), or call Milligan & Higgins at 518-762-4638 for a supplier near you.

Where to use it

If you still are stuck on synthetic glues, consider this: Almost all furniture needs repair at some time in its life. Synthetic glues don't bond well to themselves, so you'll have to remove all of the yellow glue from a joint before regluing it. With hide glue, not only can the joint be unlocked with heat and moisture, but new hide glue will bond to any hide glue left in the joint.

So the first places to start using hide glue are the areas most likely to need repair, such as feet, drawers, veneer work, and all chair joints.

With its short open time, hot hide glue also allows hammer veneering, rub joints, and many other tasks where clamping is difficult. After being held still for a minute or two, the joint can be left to cure. By the way, all hide glue creates a very rigid glueline, for laminations with no springback.

Reheat it, or mix a new batch?

In the dry state, animal glues have an infinite shelf life (longer than humans). And proper cooking does not weaken the glue, but makes it stronger. The light amber color will darken to a strong brown within days. You can just let the glue cool and gel up at the end of the day, with the brushes still in it. It doesn't hurt to cover it.

However, when left wet but not heated daily, these glues attract mold. So cook your glue every day, or just make what you need and empty the glue pot afterward. A thin layer of hard glue left in the pot will not get moldy.

REPAIRS ARE SIMPLE



To unlock any hide-glue bond, even one decades old, use steam to apply heat and moisture.

Mold, even a fine layer, means the glue is bad. Also, if the glue is heated for any length of time above 180°F or reaches 212°F at any time, it is dead. In either case, simply take the glue pot, brush, and thermometer, and clean them completely by boiling them in a pan of hot water. Start over with fresh glue.

A better glue pot—I don't recommend electric glue pots. They are expensive ($100) and can't be controlled precisely. Instead, I use a small double-boiler glue pot (about $30 on eBay), heated by a simple hot plate that you can get for $10 or $20. The outer pot holds water. The inside container holds the glue, the

Instant inlay



Apply hot glue and press it in place. *Be sure the inlay is sized correctly, and then brush glue onto it.*



Press it in place. *Edwards uses a veneer hammer to push stringing evenly into its groove.*



Easy cleanup. *After a few minutes, dampen a scrubbing pad with warm water and remove the excess glue.*

brushes, and a meat thermometer to ensure the glue is kept between 140°F and 160°F. An old trick is to put a small amount of glue into the water bath in the outer container, which will alert you if it runs out of water: It will stink!

Making the glue is no more difficult than making oatmeal. No measurement is required; just put the dry glue into a plastic cup and add enough cold water to cover the surface of the glue by ¼ in. or so. It doesn't matter how much glue you mix; just add enough water to cover it. The glue will quickly absorb the water completely. After about an hour, put the gelled wet glue into the glue pot.

When the glue is at the proper temperature (140°F to 160°F), it is ready to use, but you need to monitor the viscosity on a regular basis during the day as it cooks (see photo, p. 35). If it is too thick, add hot water (roughly the same temperature as the glue—very hot tap water will do the trick) to adjust the viscosity. Each day, when you start work, add a little cold water to the glue pot before it starts heating to replace the moisture that evaporated the day before. Remember: cold water to cold glue and hot water to hot glue.

How to use hide glue

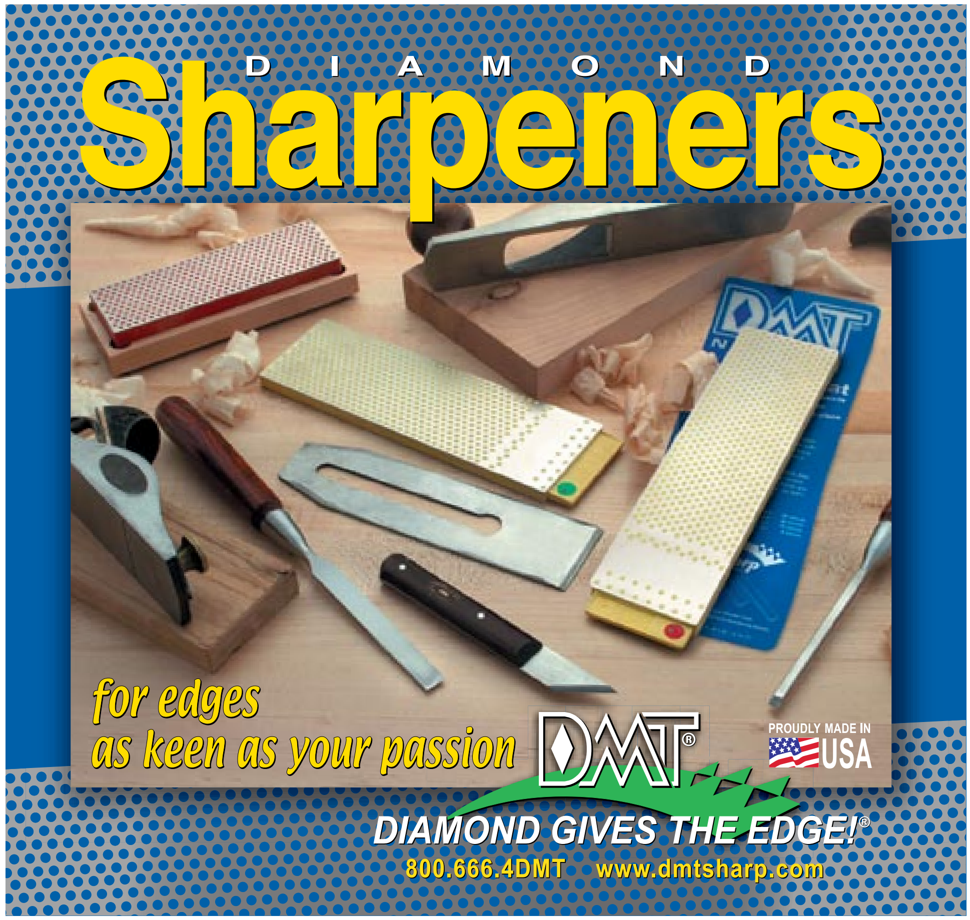
Use natural-bristle brushes and just leave them resting in the glue pot. I use two round brushes, one around ¾ in. dia. and the other under ½ in. to fit into joints. For very large areas, I use the two brushes together, held like chopsticks.

Removing squeeze-out is not as big a problem as with other glues, since soaked-in hide glue is transparent to oil- and alcohol-based finishes, even on light-colored woods like maple. You will need to remove visible globs or beads, though. The best way to do this is immediately with warm water and some kind of scrubbing tool: a toothbrush, scrubbing sponge, even a paper towel. Another way is to leave the glue to gel for three or four hours, and then peel it off. If you have to wait until the glue is rock hard, you'll need a sharp chisel to remove it.

Give high-quality hide glue a try. Then, remember to teach your kids and grandkids how to use it. □



READER SERVICE NO. 140



READER SERVICE NO. 111



READER SERVICE NO. 119



READER SERVICE NO. 29



READER SERVICE NO. 115



50-720CT
with canister


DELTA
DELTA
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Eliminate the dust that gets back into the air when emptying a reusable bag. The new DELTA 50-720 and 50-720CT dust collectors feature specially designed disposable bottom bags. Plus a 1-micron filtration rate on model 50-720 captures even the finest dust. Besides generating a powerful 650 cubic feet per minute, you'll appreciate the compact industrial design featuring solid cabinet housing and large swivel casters. So checkout the new DELTA dust collectors at deltaportercable.com/dustcollection. Because when precision is at stake, we don't just pay attention to the details of dust collection. We obsess over them.
50-720
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READER SERVICE NO. 122

A Portable Book Rack

Use a router template for perfect results

BY GREGORY PAOLINI



Years ago, while researching American Arts and Crafts designs, I took an immediate liking to Gustav Stickley's No. 74 book rack. It's shorter than most bookcases, with slats that form a V-shaped trough to hold books spine up. Its D-shaped handholds make it easy to move.

I've made a dozen racks based on that design, from small desktop versions to extra-tall ones that hold compact discs and DVDs. I've also modified Stickley's design. Simple through-tenons replace the wedged tenons. I added a second V-shaped trough in the middle to make the rack more functional, and I tapered the end panels, reflecting the look of the Roycroft designs that I favor. Despite the changes, the book rack retains its Arts and Crafts character. This version, made from quartersawn white oak, is sized to sit between a couple of Morris chairs.

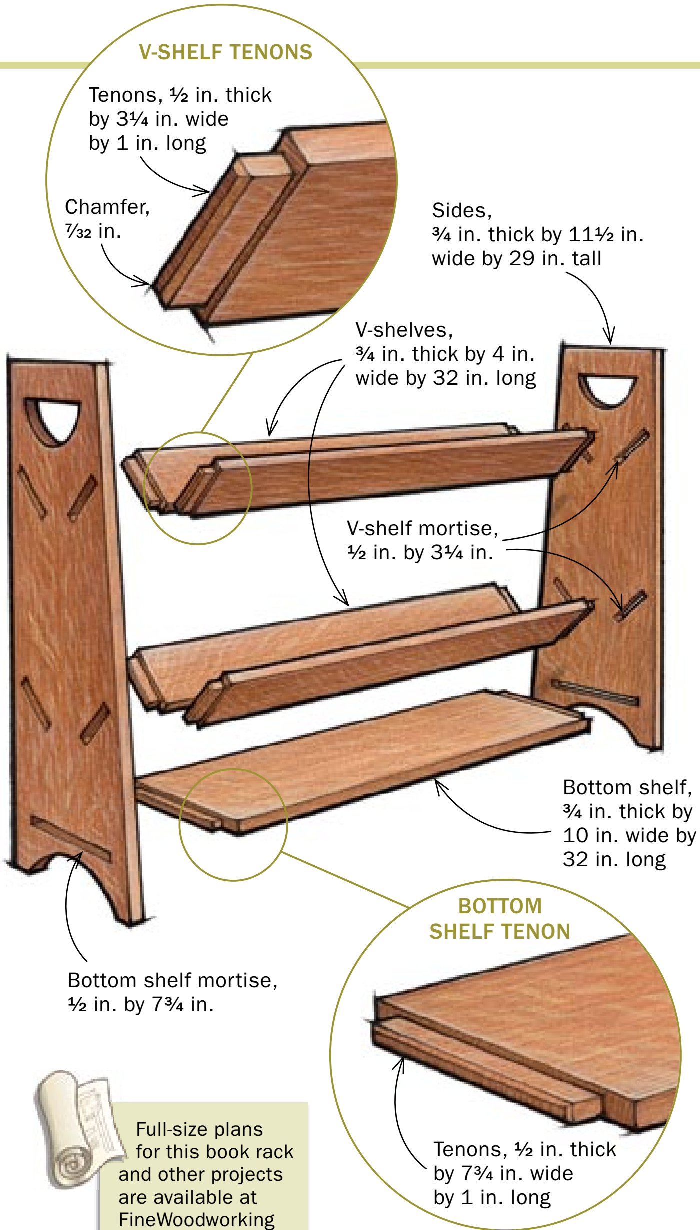
Make the end panels and router template

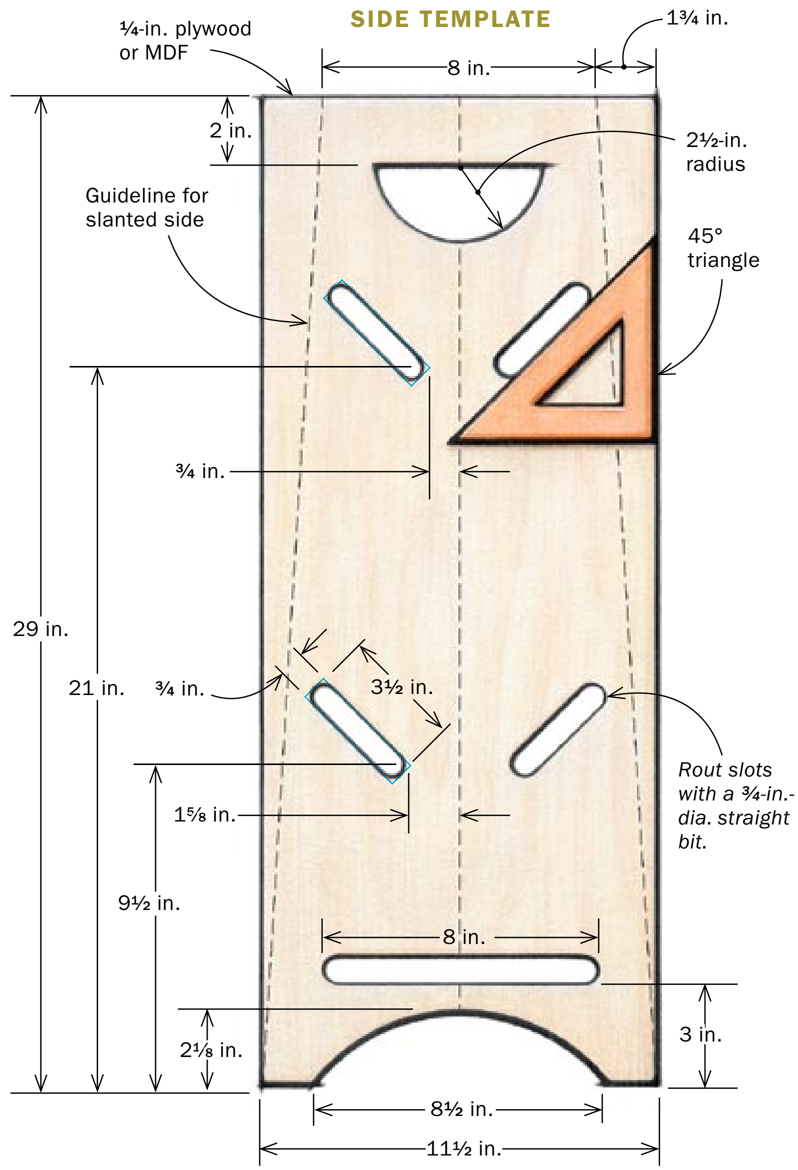
Since the end panels are the focal point, you want boards with maximum figure. Use single wide boards if you have them, or edge-glue narrower boards.

While the panels are drying, make a router template from ¼-in. medium-density fiberboard (MDF) or plywood, which you'll use to cut slots for the shelf mortises.

The template (see facing page) simplifies construction in several ways. It locates the shelf mortises, of course. And because I clamp the template to the inside face of one end piece and the outside face of the other, it ensures that the mortises will line up. When laying out the slots in the template, all you have to do is draw the dimensions for the ¾-in.-thick shelves and cut a slot that wide. When using those slots to cut the through-mortises, use a bit and

Photos, except where noted: David Heim; this page: John Tetreault





Full-size plans for this book rack and other projects are available at FineWoodworking.com/PlanStore.

MAKING THE TEMPLATE

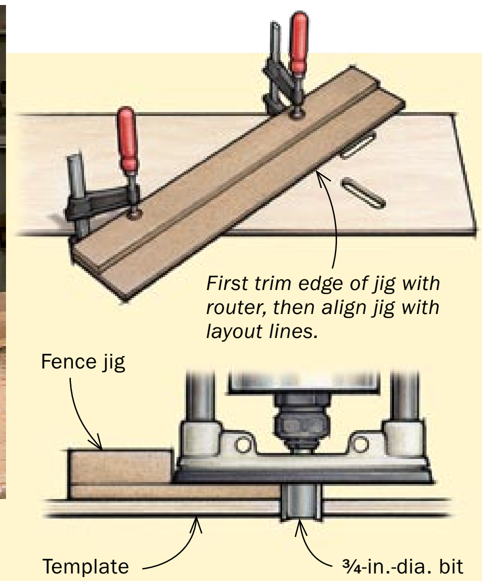
The ¾-in.-wide slots in the template will guide a router bushing for making the ½-in.-wide mortises in the workpieces.



Lay out the slots. *Align the template and the triangle against a straightedge clamped to the bench to draw the shelf outlines.*

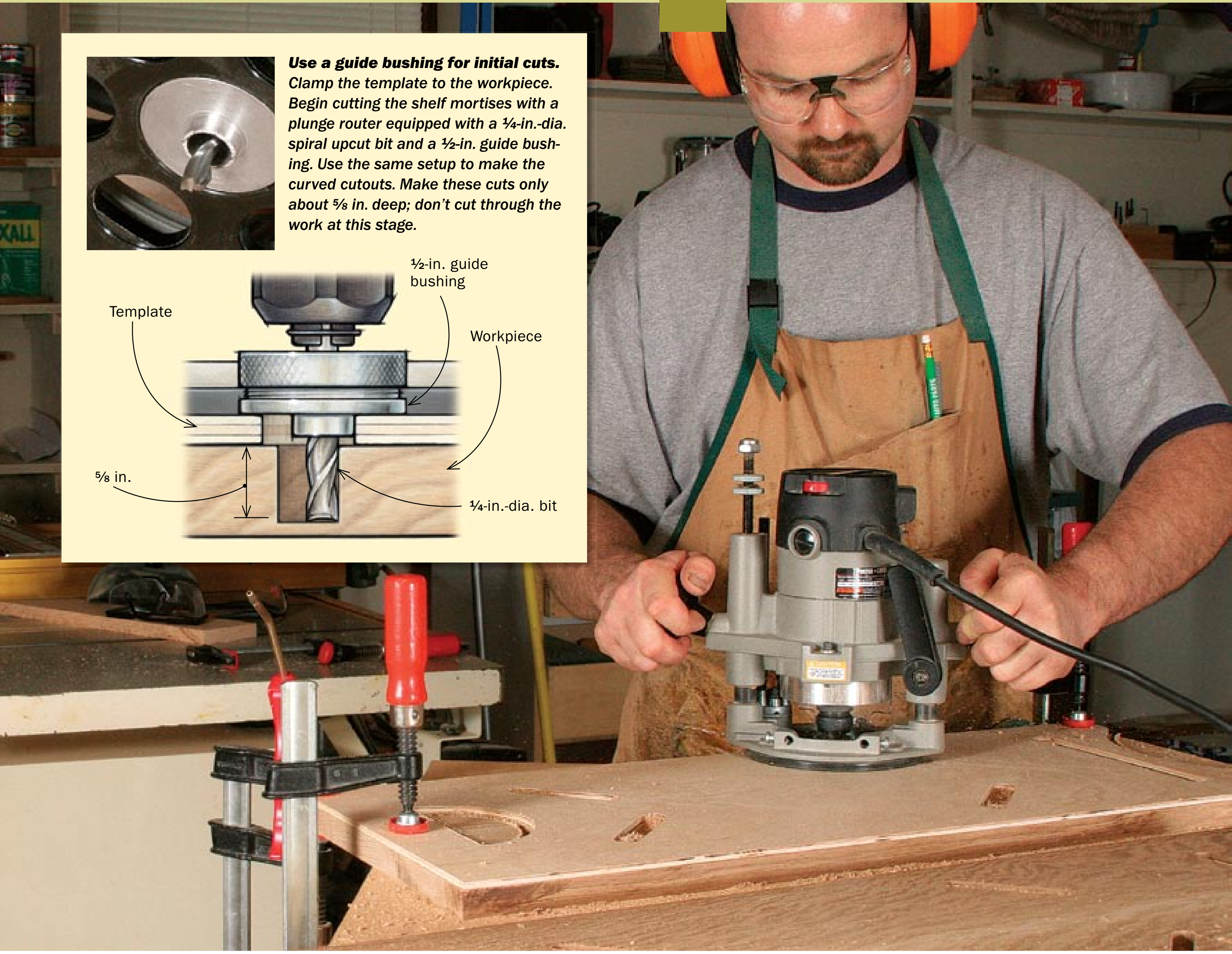


Make the cutouts. *Use a straight bit and a fence jig to cut the ¾-in. slots for the shelf mortises. Use a jigsaw for the other cutouts.*



Secret to clean through-mortises

1 Rout to partial depth



Use a guide bushing for initial cuts. *Clamp the template to the workpiece. Begin cutting the shelf mortises with a plunge router equipped with a ¼-in.-dia. spiral upcut bit and a ½-in. guide bushing. Use the same setup to make the curved cutouts. Make these cuts only about ⅝ in. deep; don't cut through the work at this stage.*

guide bushing. The offset between bit and bushing equals the width of the tenon shoulders. I get a mortise the right width, in the right location.

To avoid tearout when routing through-mortises, I work from one face toward the middle, without popping out the other side. So I rout the bulk of the mortises with the guide bushing, then use a flush-trimming bit from the other side to finish them cleanly.

Make the template 11½ in. wide by 29 in. long. Draw the panel side tapers, handle, and lower arch. Then draw rectangles representing the full size of the ends of the narrow V-shelves and the wide bottom shelf. With the template drawn, draw layout lines ¼ in. from each end of the V-shelf rectangles. For the bottom shelf, draw layout lines 1 in. from the ends. These define the starting and stopping points for the shelf mortises. To cut the mortise slots, clamp a shopmade fence jig flush with the long side of each shelf outline and plunge cut from one line to the next with a router and a ¾-in. bit. Cut out the handle and bottom arch with a jigsaw, then smooth the curves and clean up the sawmarks with sandpaper.

Online Extra

Watch Paolini demonstrate his router technique. For a video, go to **FineWoodworking.com/extras.**

Mill the oak and cut the mortises

Next, I mill all the oak shelves to size and cut the glued-up end panels to length. However, I

Drawings: Christopher Mills

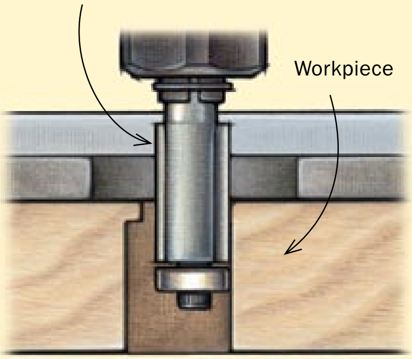
2 Drill, flip, and clean up





Starter holes for the next step. *Drill a hole to allow the flush-trimming bit to enter the mortise. Start with a small pilot hole to locate the center. To prevent blowout, follow with a larger bit from the other side.*





Flip the work and finish with a flush-trimming bit. *Finish the mortises and other cutouts with a ⅜-in. flush-trimming bit, working from the opposite face. To clean up the D-shaped handle and the cutout at the foot, cut away most of the waste with a jigsaw, then use the same bit to smooth the edge.*

won't taper the panels until I've finished making all the cutouts with the router.

I make the mortises and cutouts on one panel at a time. Rather than clamping them together and cutting everything at once, I set up the template so that the panels are oriented as copies, not mirror images. In other words, the template goes on the outside face of the left-hand panel but on the inside face of the right-hand panel.

Register the template to the side and bottom of the end panel. You can use a long scrap of wood as a fence to help align the template with the side. Clamp the assembly to the bench and mark a small dot on the bottom of the right foot. You'll use that mark to reference how you laid out the panel.

Set up the router and bushing. The ¾-in.-wide slots in the template will produce a ½-in.-wide mortise in the oak, using a ¼-in. spiral bit and a ½-in. bushing. You could also use a ⅜-in. bit and a ⅝-in. bushing. However, the smaller bit leaves a tiny ridge dead-center in the groove, which comes in handy later on.

Rout the outlines for the D-shaped handle, the lower arch, and the shelf mortises in several passes. Don't cut all the way through. When the cuts are about ⅝ in. deep, stop and remove the template. Use a jigsaw to remove most of the waste from the handle and the lower arch.

Drill a hole through each shelf mortise. This is where you can use that ridge left by the ¼-in. bit. I like to use it to center a 1⁄16-in.-dia. pilot hole. Then I flip the panel over and enlarge the pilot hole with a 13⁄32-in. bit. This gives me a starting place for the router bit I use next.

Flip the panel over, and finish all the cuts with a ⅜-in. flush-trimming bit. I chuck the bit in a laminate trimmer. It's easy to control and lets me easily see what I'm doing.

These extra steps guarantee that you won't have any tearout. Square up the mortises with a chisel, working from each face toward the middle to avoid tearout. Finish the panels by tapering the sides on the bandsaw, cutting just to the waste side of the



Square up the corners. *Cut away the waste in the corners with a chisel. Chop about halfway down, then flip the work and finish by paring from the opposite face toward the center.*

Cut tenons on the tablesaw



Define the shoulders. *Use a combination blade to make the initial cuts for the tenon shoulders. Make these cuts about 1⁄32 in. deeper than the tenon, to define the shoulders cleanly.*

line. I clean up the cuts with a router, using my shopmade edge guide and a straight bit.

Cut the tenons on the tablesaw

The through-tenons on the shelves project ¼ in. from the side panels. They have narrow shoulders on their wide faces, and deep shoulders on the sides. The shoulders hide some imperfections and make glue-up much easier. I cut the tenons on the tablesaw, defining the shoulders with a combination blade to minimize tearout, then switching to a stacked dado set to finish.

You should purposely make the shoulder cuts a hair too deep, which prevents a ridge at the inside corner that you'd have to clean out later.

Trade the combination blade for a stacked dado set to finish the tenons. Cut the wide cheeks first. Set the blade low and raise it gradually through a series of cuts to sneak up on the proper tenon thickness. Test the fit after each cut. Once that first tenon fits the mortise just right, cut the rest. Follow the same procedure to cut all the short cheeks.

Next, chamfer the ends of the tenons. Mark a line 7⁄32 in. from the ends, then plane to that line at roughly a 45° angle. Plane the long edges first, then plane the short edges.

Finally, soften the remaining sharp edges of the shelves and side panels with a ¼-in. roundover bit in the router.

Fit and finish

Dry-fit the piece. The tenons should slip into their mortises with hand pressure. If you need a mallet, the joints are too tight and



Finish with a dado set. *Use a stacked dado set to cut away the waste on each tenon. Check the first tenon often against its mortise to creep up on the right blade height.*



The result. *You should have tenons with even shoulders, smooth cheeks, and a nice fit.*



Chamfer the tenon ends. *Use a block plane to chamfer the portion of each tenon that will be proud of the side pieces, working to a layout line. To minimize tearout, plane the wide cheeks first, then the narrow ends.*



Fit, finish, and glue-up



Fine-tune the fit. *The tenons should fit into the mortises with hand pressure. At the end, you may need to remove a small amount of excess with a coarse file (left) or a shoulder plane.*





Dye, then stain. *A brownish dye, followed by a darker oil stain, produces a finish that's very close to fumed oak. Mask the tenons to keep finish off glue surfaces (above). When applying the finish, work carefully to keep the stain out of the mortises (right).*

you'll need to pare down the tenons with a shoulder plane or a coarse file.

Smooth the pieces with a random-orbit sander, finishing with P180-grit. Then hand-sand all the pieces with P180-grit paper, working with the grain, to minimize any sanding swirls.

I like to do some of the finishing before assembly, when the pieces are easy to handle. To keep finish off the tenons, I wrap them with ½-in. masking tape.

To simulate the look of ammonia-fumed oak, I follow Jeff Jewitt's technique for using dye and pigment stain ("Safe and Simple Arts and Crafts Finish," *FWW* #157). For a simpler finish, I like Minwax Early American 230 stain followed by clear shellac or varnish, which looks remarkably like one of Stickley's original finishes.

After the stain has dried, glue up the piece. If you get any squeeze-out, let it dry, then peel it off.

In keeping with the Arts and Crafts tradition, I use shellac as a topcoat. I typically brush on six or seven coats of Zinsser SealCoat thinned to a 1-lb. cut. After the shellac has cured, I rub out the piece with mineral oil and 0000 steel wool, giving the piece the satin sheen typical of this style of furniture. The finish should provide plenty of protection for a few generations of readers. □

Gregory Paolini makes Arts and Crafts furniture in Waynesville, N.C.



Glue, then shellac. *To reduce squeezeout, put most of the glue on the tenons and only a dab in the mortises. When the glue has cured, apply several coats of thinned shellac. As a final step, rub out the finish.*

TOOL TEST

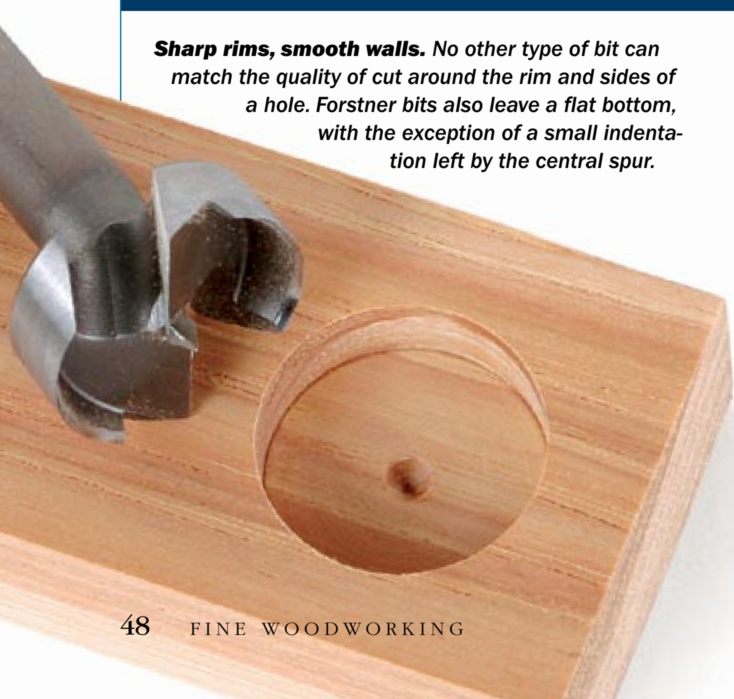
Forstner Bits

For unmatched quality and precision in your drilling, you can't beat these bits. We look at 18 brands to see which are best

BY ROLAND JOHNSON



THREE GOOD REASONS TO USE THEM



Sharp rims, smooth walls. *No other type of bit can match the quality of cut around the rim and sides of a hole. Forstner bits also leave a flat bottom, with the exception of a small indentation left by the central spur.*



Drilling at an angle. *The sharp rim makes it easy to start the bit in a steeply angled workpiece, as when cutting pocket holes in a table apron.*



Overlapping holes. *Again, the rim design allows you to drill clean overlapping holes, as when excavating a mortise.*

Photos: Mark Schofield; drawings: John Tetreault

Few woodworking tasks are as frustrating as trying to bore the perfect hole—accurately sized, accurately located, and with a cleanly cut rim. Standard woodworking twist bits, originally designed to cut metal, often leave ragged, inaccurate rims, are difficult to place accurately, and can wander off course resulting in uneven holes. Brad-point bits are better, creating accurate, clean holes, but they don't make it easy to bore overlapping holes or enter the wood at a sharp angle.

The best design for boring high-quality holes is a Forstner bit. Since it was patented by Benjamin Forstner in 1874, this bit has been helping woodworkers cut clean holes with precision (see photos, facing page). Today, Forstner bits come in a variety of designs. To find out which ones are best, I tested 18 brands. The top nine bits are listed on the following pages; the rest are shown on FineWoodworking.com.

How the Forstner bit has changed over the years

The original Forstner bit did not have a center spur and was guided solely by the rim. The design left a clean-sided, flat-bottomed hole, but the bit was hard to position. Most of today's Forstner bits have a center spur and a partial rim. The center spur positions the bit precisely on the workpiece but leaves a small dimple in the center of the hole. In a stand-alone hole, the spur makes the initial contact with the wood, but in other cases the rim alone can be in contact with the wood, guiding the bit.

Testing for accuracy, design, and endurance

I tested ½-in.-dia. and 1-in.-dia. bits. The former represent typical smaller bits used for drilling mortises and pocket holes, while the latter allowed us to test the toothed rims that most manufacturers use for larger bits.

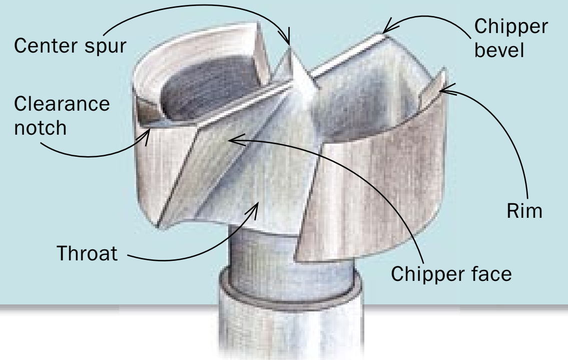
I measured the diameter of each bit to see how close it was to the specified size, and then I measured the diameter of the hole itself. Most of the holes were less than 0.005 in. larger than their respective bit, an acceptable amount.

The next series of tests was to see how the ½-in. bit cut overlapping holes and holes drilled at an angle. As I mentioned already, bits with the largest rim did best at this test, while those with little or no rim and only outside spurs were at a disadvantage.

Bits choked with chips don't cut well—With smaller Forstner bits, the proper procedure is to lift the bit out of the cut during deep boring to evacuate the chips. If this isn't done, chips may become compacted behind the bit, locking the bit in the hole and making it difficult to extract. If the chips plug in the bit, you must stop the drill and clear the

ANATOMY OF A FORSTNER

Although types vary, the cutting action is similar: The spur touches down, the rim keeps the bit on track, and the chippers create a flat bottom.



A GOOD BIT OF VARIETY



CARBIDE VS. DIFFERENT STEELS

The majority of Forstner bits are steel, which usually starts out sharper than carbide but has a shorter edge life. Other choices include titanium-coated steel, designed to increase durability, or stainless steel, ideal for working with green wood, treated material, or any other high-moisture applications that would pose rust problems for standard steel bits.



RIM STYLES VARY

Longer rims provide better guidance but tend to overheat. On this high-carbon-steel bit (far left), heating may have removed the temper. To overcome heat, many manufacturers give 1-in.-dia. and larger bits toothed rims. Others, particularly on smaller bits, use cutting spurs only. While fine on stand-alone, horizontal cuts, spurs can't cut overlapping or angled holes with the same finesse as bits with extensive rims.

CENTER SPUR OR FLAT BOTTOM?

All of the bits in the review are good at boring flat-bottomed holes with small dimples created by the spur. MLCS uses a screw for its spur, which can be slid back into the bit to leave only a slight bump in the bottom of the hole.





HOW WE TESTED



Exactly the diameter claimed? *The actual diameter of every bit was measured (above) and the discrepancy with the stated diameter recorded. Most holes were slightly larger than the bit that drilled them, indicating slight runout (right).*



Plugged up. *Many of the ½-in.-dia. bits became badly plugged when the head went below the wood's surface. Johnson uses a pencil to eject the plug.*



Friction causes heat. *While cutting 100 holes in hickory, the temperature of each bit was recorded 10 times using a digital infrared thermometer. Bits that cut cleanly generated less heat.*

9 bits made the cut

After all the tests were done, seven steel bits stood out. Also shown are the best carbide bit (Freud), and one with a retractable tip (MLCS).



BRAND		BOSCH	FAMAG
SUPPLY SOURCE		www.amazon.com	www.traditional woodworker.com; www.woodcraft.com
STREET PRICE	½ in.	$60 set of 7	$12
	1 in.		$16
BIT DIAMETER IN.	½ in.	.498	.500
	1 in.	.996	1.005
HOLE DIAMETER IN.	½ in.	.505	.500
	1 in.	1.001	1.006
CHIP CLEARING	½ in.	Clears	Clears
	1 in.	Clears	Clears
AVERAGE TEMPERATURE °F		181	150
QUALITY OF BORE RIM	½ in.	Very good	Excellent
	1 in.	Very good	Excellent
OVERLAPPING HOLE ABILITY	½ in.	Excellent	Excellent
	1 in.	Excellent	Excellent
ANGLED HOLE ABILITY		Very good	Excellent

blockage, a time-consuming and annoying task. Plain and simple, a plugged bit won't cut well and may increase friction and burning.

Several of the ½-in. bits got plugged as soon as the rim was fully enclosed in the bore. The large bits had an easier time evacuating chips because they have larger gullets between the chipper, or cutter, and the back edge of the rim.

These bits can take the heat—To test their longevity, I mounted each 1-in.-dia. bit in a drill press. I chose the larger bits for this test because there is a greater area in contact with the wood, and therefore more friction. I set the speed to 480 rpm and drilled 100 holes 1 in. deep in hickory, a wood known for its ability to dull a sharp cutter. I used a digital infrared thermometer to check each bit's temperature every 10 bores. An increase in temperature could



AUTHOR'S BEST VALUE CHOICE

STEEL BITS					CARBIDE BITS	
FISCH	FREUD	GRIZZLY	PORTER-CABLE	WOODCRAFT	FREUD	MLCS
www.amazon.com	www.amazon.com	www.grizzly.com	www.amazon.com	www.woodcraft.com	www.amazon.com	www.mlcswoodworking.com
$7.50	$45 set of 7	$30 set of 16	$40 set of 12	$4.50	$12	$60 set of 7
$14				$6.50	$17.50	
.499	.500	.500	.501	.501	.502	.617*
1.001	1.000	1.002	1.002	1.003	1.009	.996
.507	.506	.500	.503	.506	.502	.622
1.003	1.004	1.003	1.002	1.003	1.009	1.000
Plugs	Minor plugging	Clears	Clears	Clears	Clears	Plugs
Clears	Clears	Clears	Clears	Clears	Clears	Plugs**
165	161	174	177	134	184	186
Very good	Very good	Very good	Excellent	Very good	Very good	Very good
Excellent	Very good	Good	Very good	Very good	Good	Very good
Very good	Very good	Very good	Very good	Very good	Very good	Good
Excellent	Very good	Very good	Very good	Very good	Good	Good
Very good	Excellent	Excellent	Very good	Very good	Good	Good

*⅝-in. bit smallest size in set   **if more than ¾ in. deep

signal a dulling cutting edge. While the average temperature ranged from 134°F to 268°F, none of the bits showed any significant elevation in temperature or deterioration in hole quality toward the end of the borings, indicating that they were still cutting as well (or as poorly) as at the start. In general, bits that made cleaner cuts generated less heat.

The best buy and the best bet

I chose Famag bits, sold by Traditional Woodworker and Woodcraft, as the best overall. They have the longest rims but tight machining tolerances. As a result they cut accurately, run cool, and are easy to operate.

Grizzly gets the nod for best value. These bits did a fine job of boring, cleared chips well, and stayed at moderate temperatures. At less than $2 apiece for a set of 16, they are a great value.

The chart lists five other brands of steel bits that were a cut above the rest, as well as the best carbide bits. I didn't find an advantage with carbide over steel in my limited endurance test, but carbide should hold an edge longer, so a production shop might want to go with the Freud carbide bits. If a truly flat-bottomed hole is the deciding factor, the MLCS bits with the removable center spur are the ones to buy. □

Online Extra

To see how the other nine brands of Forstner bits performed, go to **FineWoodworking.com/extras.**

Roland Johnson is a contributing editor.









8 Tips for Flawless Moldings

Smart router setup and technique yield crisp profiles and silky surfaces

BY STEVE LATTA

A crisp molding lends the same touch of elegance to a well-made cabinet that a silk tie bestows on a sharp-dressed man. But in order for their magic to work, neckties and moldings both must be treated with care. A molding with torn-out grain or fuzzy edges will spoil the effect—like a soup stain in the middle of your chest.

I don't have to fuss with a necktie very often, but my students and I do run plenty of molding. I've adopted several techniques for making sure the results fit well and look their best. Creating molding safely and cleanly requires careful attention in three areas: cutting profiles, cleaning them up, and, finally, ripping the individual molding strips. The suggestions here touch on all of these areas.

Contributing editor Steve Latta teaches cabinetry at Thaddeus Stevens College in Lancaster, Pa.



1 Use a sacrificial fence to tame tearout

To eliminate tearout, I like to bury the bit in a wooden fence, creating a zero-clearance cavity that lets the fence serve as a chipbreaker. There are two types of this fence that I make most often; both start with a good scrap of wide 2x stock with a jointed face and edge.

The first is a very simple fence that I make by using the bit itself to cut the zero-clearance cavity. Clamp one end, bury the bit a little deeper than you need, then bring the fence back to the appropriate setting and clamp the free end. If you are raising the bit into the fence, go only as high as necessary. Creating a cavity taller than your final bit height reduces the chipbreaking effectiveness.

For complex bits or those that can't cut their way into the fence, such as bearing-guided bits, I drill the fence opening with a Forstner bit. This also makes it easier for me to joint the infeed side if I need an offset fence. I also cut a channel in the back of the fence for chip removal.

To prevent chipout in heavily figured stock, I reorient this fence so that the bit is literally buried in the infeed side. To do this safely, clamp a straight backer board behind the fence. Loosen the clamps that hold the fence and, with the router running, slide the infeed side of the fence into the bit. The movement is very controlled because the rotation of the bit pushes the fence against the backer board. After setting the fence, reclamp and continue running the molding.

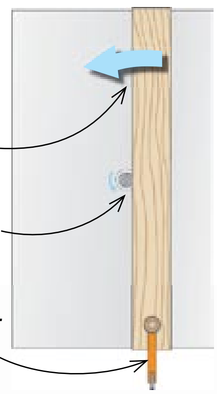
Another advantage of any sacrificial wooden fence: I can quickly screw guards or hold-downs in place.

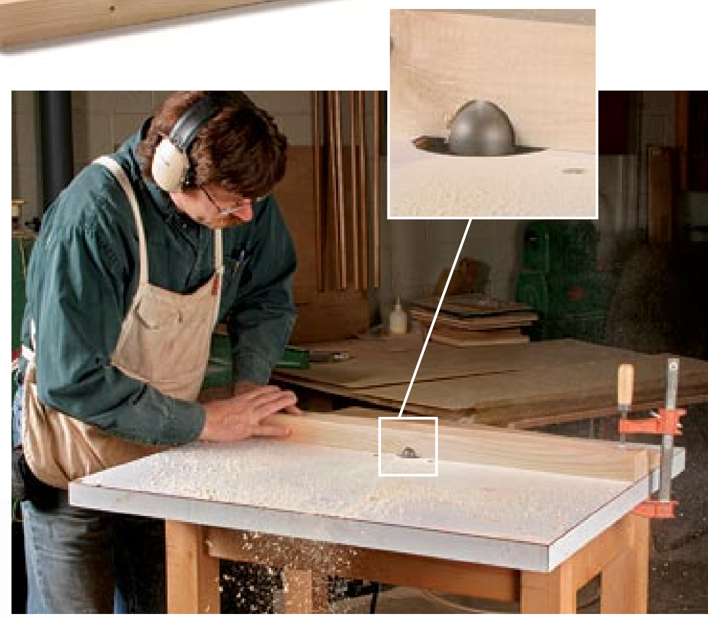
Of course, a good table and router are also important. Reinforce an MDF top with angle iron or C-channel, if need be, to prevent sag. As for routers, I recommend a fixed-base model with at least a 1½-hp motor. See "Routers for Router Tables" in *FWW* #189.

A SIMPLE FENCE FOR SIMPLE BITS

A bit with no bearing or post on top can cut its own deep, zero-clearance cavity. Start with a jointed piece of 2x stock.





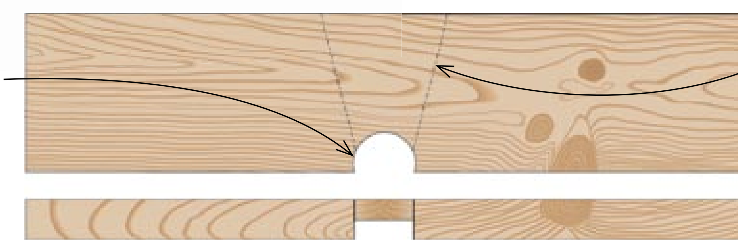


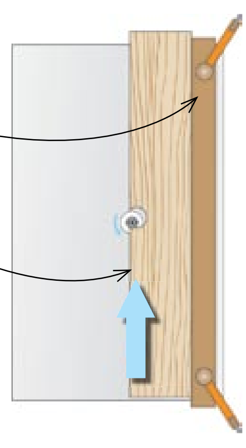
Bury the bit. *Clamp one end of a wooden fence to the router table and, from the other end, carefully pivot the fence into the rotating bit. Then clamp it down.*



A FENCE FOR COMPLEX PROFILES

Drilling the opening is easier for tall, complex profiles. To create zero clearance, bury the bit on the infeed side.





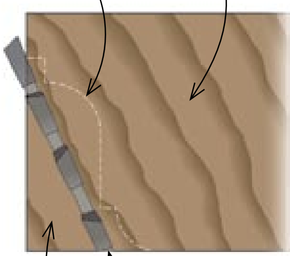




Push the fence into the bit. *The infeed edge of the bit is buried, so the workpiece fibers are fully supported where the bit exits the cut.*

Photos, except where noted: Steve Scott; individual boards: Kelly J. Dunton

2 Use the tablesaw to hog off waste





Saw away the waste. *Doing so saves wear on router, bits—and ears.*

After drawing the profile on the end of a piece, I use the tablesaw to cut away as much waste material as I can, making sure the blade is tilting away from the fence. Roughing away this extra stock allows lighter passes with the router.

3 Cut molding on a wide blank



Choose a piece of stock that is wide enough to run a profile on each edge while leaving a few inches in the middle. A bigger workpiece means less vibration and better results. It also lets you run the molding much more safely, keeping your hands well clear of the spinning bit while controlling the stock. It's also much easier to clean up moldings while they are part of a wider piece that can be clamped easily while the profile is scraped or sanded.

Pay close attention to the feed rate. Too fast leads to chipping; too slow can cause burns. Wax the table and fence to keep resistance to a minimum.

After the molding is done, rip it away on the tablesaw (Tip 8).



Keep fingers safe. *A wide workpiece can be fed into the cut with hands well clear of the bit.*

4 Glue up your own stock to produce a wide molding

When you want to cut a wide molding in figured wood like bird's-eye maple, you might not find stock thick enough. My solution is to make my own.

I do this by ripping a thinner board into strips a little wider than the thickness I want. Stand these strips on edge and laminate them face-to-face to create a glued-up board with enough thickness for the desired moldings. Glue up the blank with a piece of scrap stock as a backer board. This lets you cut multiple molding strips in the reoriented face grain while keeping your hands safely away from the bit.

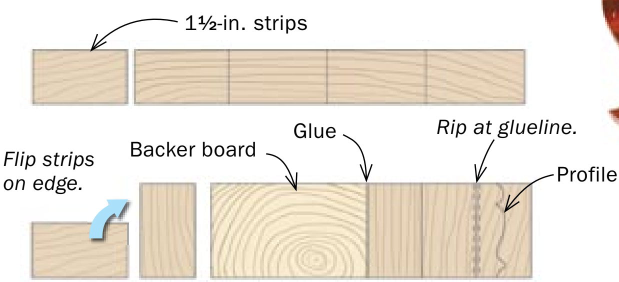
Assemble the blank so that each glue joint falls in a tablesaw kerf when the moldings are ripped. You'll need to account for the kerf width, the amount of stock removed in cutting the profile, and the thickness of the finished molding.



Cut from a wide board. *This keeps your hands safe and, because a wide board is more stable, ensures that the work doesn't chatter as you cut.*

CREATE A THICK BLANK FROM THINNER STOCK

Rip 1½-in. strips from 4/4 stock, flip the strips on edge, and glue them together, face-to-face. Use a scrap of jointed pine as a backer board in the center of the glue-up. After the glue is dry, surface the stock to the necessary thickness.

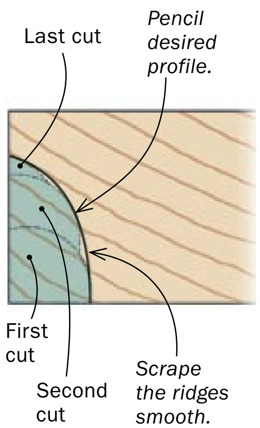




5 Reduce chipout by cutting in the right sequence

SINGLE-BIT PROFILE

Multiple runs with a core-box bit yield a custom cove. Each cut removes tearout from the previous pass.





Cover your tracks. *When using multiple passes to cut different sections of the same profile, sequence the cuts so that each pass removes any tearout left by the previous cut.*

Sometimes a simple profile requires multiple passes of the same bit. The simple cove shown above is a case in point. Because I don't have a specific bit that cuts the proportions I need, I run this molding with multiple passes using a core-box bit.

In this situation, I find that I can reduce chipout dramatically by making the first pass with the bit set at the point farthest from the fence. I then raise the bit and move the fence toward the workpiece with each successive pass. In this way, the chipout created by each pass is removed by the subsequent passes. For the final run, I make sure the bit is buried in the fence, reducing the likelihood of any chipout.

This technique also helps when cutting complex profiles using a combination of different bits. This is sometimes necessary because many complex-profile bits don't quite fit specific design requirements. By combining cutters, you can match older moldings or create original designs.

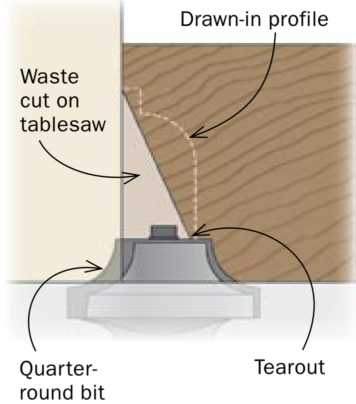
The delicate crown molding at right—for a small chest—is made by combining three cutters: an oversize beading bit from Eagle America (www.eagleamerica.com), a core-box bit, and a straight bit.

Start by cutting a sample section of the profile to use as a setup piece. Creating this piece also brings to light any unforeseen problems in the process. If you create the molding often, hang the sample on the wall for future use.

MULTIPLE-BIT PROFILE

Sequence the profiles to remove tearout, starting at the bottom and inside on the molding.

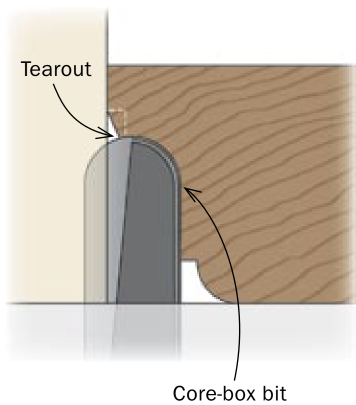
1. START ON THE INSIDE





Start with the lower quarter-round. *Running this bit first will cause some tearout at its top edge. This line of tearout will be removed when the core-box bit establishes the cove.*

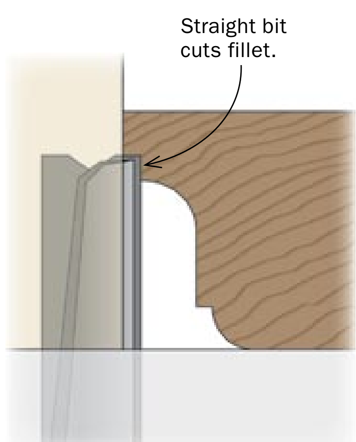
2. THEN WORK IN THE MIDDLE





Run the cove in multiple passes. *Raise the bit a little each time. Any chipout along the outside edge will be removed when the fillet is cut.*

3. FINISH AT THE OUTERMOST PORTION OF THE MOLDING





Finish with the fillet. *Use a straight bit buried in a fresh fence to prevent tearout.*

Photo, facing page (bottom right): Mark Schofield; drawings: Kelly J. Dunton

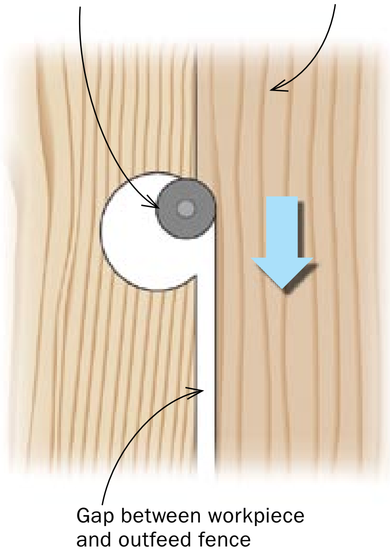
6 Use an offset fence when molding an entire edge

Profiling an entire edge is very much like jointing the edge of a board: all of the original surface is removed to create the profile. With a standard setup, this means the profiled workpiece won't ride against the outfeed fence. For proper support, the outfeed fence should be set flush with the cutter while the infeed fence steps in about 1⁄32 in. Make passes on a scrap piece to dial in the offset.

Although this might sound a little complicated, it's actually quite simple to set up. Take a jointed piece of 2x stock and drill an opening for the bit. Set the jointer to a 1⁄32 in. depth of cut and joint the edge of the fence just to the cutout. Lift it off the table and ... shazam! You have an offset fence.

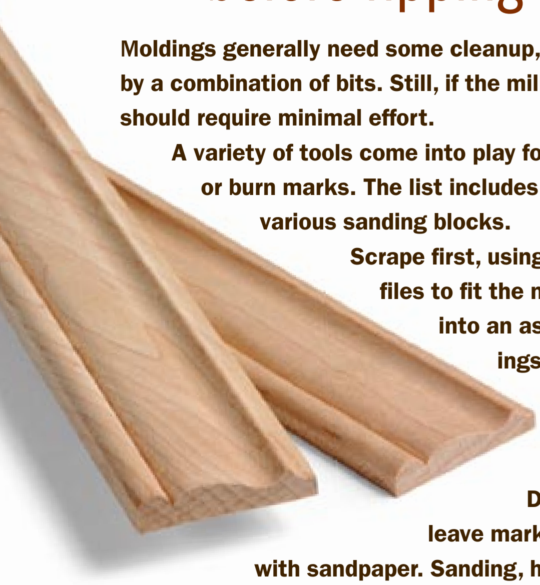


THE PROBLEM: NO OUTFEED SUPPORT



No fence support. *When the bit removes the entire bearing surface, a standard fence can't support the outfeed side.*

7 Clean up before ripping



Moldings generally need some cleanup, especially if the profile was generated by a combination of bits. Still, if the milling was executed properly, that cleanup should require minimal effort.

A variety of tools come into play for taking off tearout, tool marks, chatter, or burn marks. The list includes scrapers, a shoulder plane, files, and various sanding blocks.

Scrape first, using scrapers fashioned to a variety of profiles to fit the need. Shape cutoffs from card scrapers into an assortment of beads and rounds. For moldings like bracket feet, grind a scraper close to the profile. Don't go for an exact match because you'll need to attack from various angles.

Detail files work well for small radii and leave marks small enough to be removed quickly with sandpaper. Sanding, however, should always be kept to the essential minimum. I tell my students that after just a few minutes of sanding, the only thing they are really sanding away is their grade.

I tend to use aluminum-oxide paper ranging in grit from P150 to P220. Most times, I use a sanding block or a piece of dowel stock for an appropriate curve. Contour sanding grips are available, but these seem like one more thing I don't really need to accomplish a basic task.

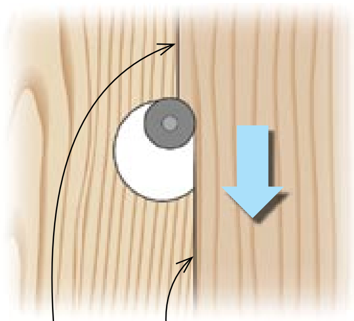


This should be light duty. *With proper cutting technique, moldings should need only minimal cleanup. Latta grinds custom shapes in card scraper stock.*

THE SOLUTION:
MAKE AN OFFSET FENCE



An offset fence in one easy step. *Simply joint the infeed edge, stopping at the bit cutout.*





Running smoothly. *The offset fence supports the work on the outfeed side and makes for a smooth cut.*



Use a shoulder plane for flats and fillets. *The Stanley No. 92 works great at getting into corners.*



Sand sparingly. *Dowels of different diameters work well for coves and other hollows. Be careful to avoid rolling the dowel over any hard edges. Doing so takes away essential detail.*

8 Rip between the blade and fence for consistency





Rip to a consistent width. *When ripping thin strips like this, a notch in the end of the stock provides a secure grip for a narrow push stick (right).*

When cutting molding from a blank, standard safety practice calls for setting the tablesaw fence so that the ripped molding falls to the outside of the blade. The fence is then reset and the process repeated for the molding on the other edge. But repeatedly resetting the fence can lead to variations in the thickness of the different pieces. This problem can make it harder to install the molding properly.

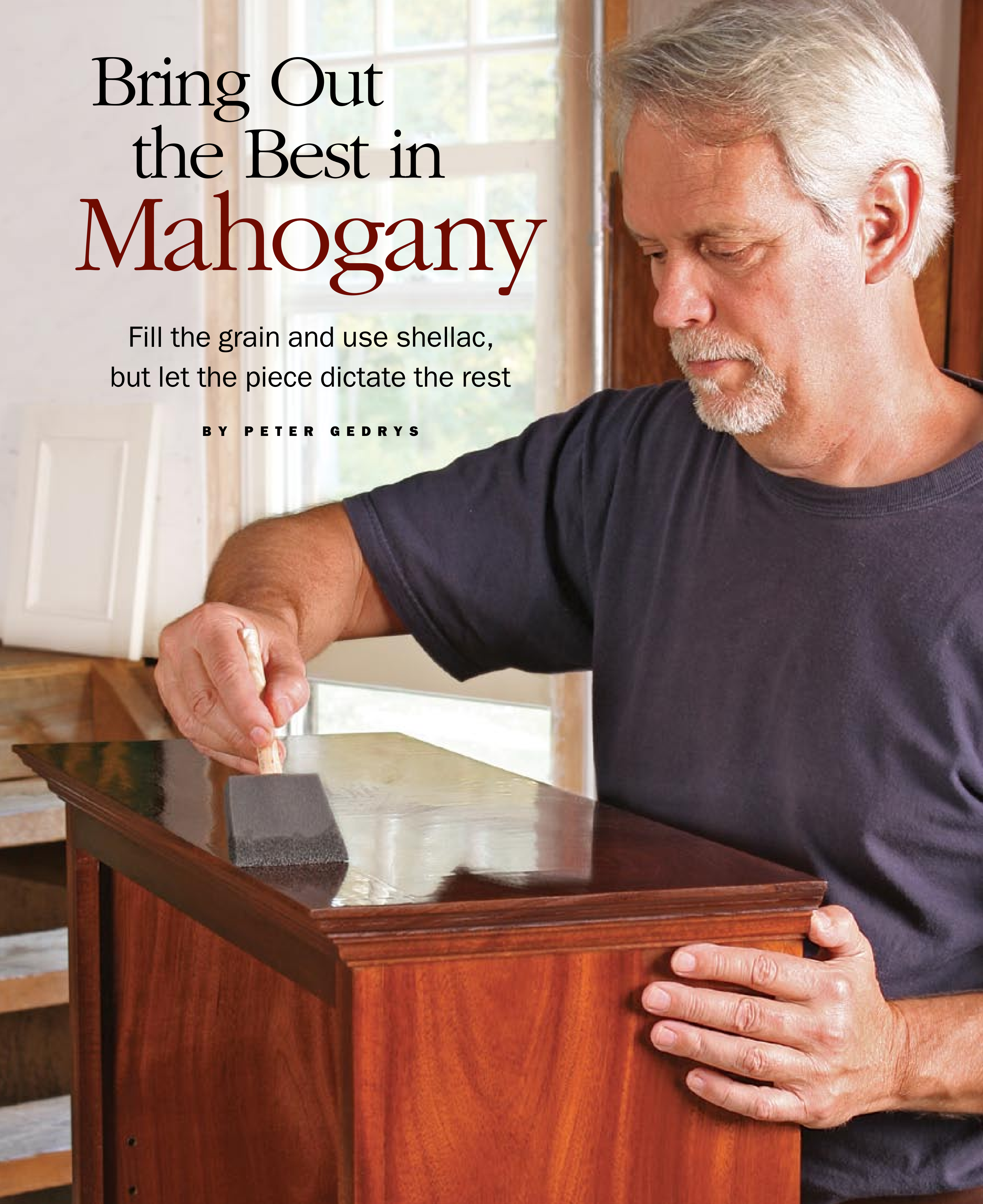
To avoid this, I rip off the molding between the blade and the fence. The distance between the fence and the blade never changes, so the thicknesses are far more consistent. And because you're not resetting the fence after each cut, the work also goes more quickly.

But this method demands extra precautions. Use a splitter to prevent the molding from curling into the back of the blade and causing kickback. Stub splitters stay out of the way but get the job done. Push sticks and hold-downs are also important. A small bandsaw cut in the end of the molding stock lets you hook a narrow push stick into it. A hold-down clamped to the fence keeps the stock from lifting off the table.

Bring Out the Best in Mahogany

Fill the grain and use shellac, but let the piece dictate the rest

BY PETER GEDRYS



1 APPLY DYE IF NECESSARY



Reading the wood. *To get an idea of what the wood will look like under a clear finish, wet the surface with denatured alcohol.*





Harmonize the color. *To merge the pale face frame with the rest of the piece, Gedrys applies a water-based dye using a folded paper towel. Look ahead of your hand to get a nice, straight line.*

Before I start a finishing project, I always let the wood tell me what it needs. I wipe the surface with denatured alcohol to preview the appearance of a clear finish. There are times when dyes and stains are called for, perhaps to enhance otherwise plain boards. On this bookcase, the top and sides had beautiful figure and color, and the piece had been left unfinished for a long time, allowing the wood to develop a rich, natural hue.

So I knew I could use my basic mahogany approach for most of this bookcase: Fill the open pores and then apply a thin coat of shellac for a warm, even glow. Leave out the grain filling, and you get a hungry, half-finished look. Put a thick film finish everywhere, and the topcoat is the star, not the wood.

However, like all pieces, this one had specific needs. A characteristic of mahogany is its wide range of colors. After wiping the surface with denatured alcohol, the face frame was much lighter than the rich, warm tone surrounding it. The solution was to dye it to match. Finally, some varnish on the top would give that most vulnerable surface some added water resistance. One of the big lessons here is that not all parts of a piece need the same finish.

Harmonize color inconsistencies

To give the face frame a subtle color change, I started by dampening the wood to raise the grain and sanding it lightly when dry. Then I used a water-based dye, W.D. Lockwood's Chippendale red brown #57 (www.wdlockwood.com). A quick note on mixing dye: I mix new batches into a concentrated or "saturated" color: 1 oz. of dye to a pint of very hot water. Once cooled and filtered through a fine paint or coffee filter, just add it incrementally to clear water for the desired strength. For the face frame, I used the dye at approximately half strength. Be sure to test the dye on scraps from the same board.

An industrial-strength paper towel makes an effective application tool. Fold it over a couple of times to create a reservoir. Wet it well with dye and squeeze out the excess.

Fill the grain with paste filler

Prior to filling the pores, you need to seal the wood with a thin washcoat of finish. This washcoat acts as a barrier so color in the filler doesn't stain the wood. The goal is to seal the wood yet still leave the pores open enough to accept the filler. I used Zinsser's SealCoat, a dewaxed clear shellac compatible with any topcoat.

I prefer the speed and control given by a pad, but you also can apply the shellac with a brush. I use a fairly large pad that will cover the surface quickly. It consists of a high-quality cheesecloth core wrapped in a piece of smooth cotton such as a well-used bedsheet or a piece of linen. Whatever size pad, the one rule is to have no wrinkles on the bottom that will leave lines on the surface of the wood. To charge



SEAL WITH SHELLAC 2



Seal the wood. *Go over the surface a couple of times with a pad to apply a thin coat of shellac. Keep the pressure light to avoid filling the pores. It is easier to get into corners, carvings, and moldings by applying the shellac with an artist's brush (above).*

3 FILL THE GRAIN





Color the grain filler. *Use artist's oils to color the filler to match or to be slightly darker than the wood.*







Wipe on, scrape off. *Use an old brush or a cotton pad to cram the filler into the pores (above left). Then push a plastic scraper diagonally across the grain to remove as much filler from the surface as possible. The filler is ready to be removed when it wrinkles up onto the scraper (above right). A white pad (www.woodworker.com, #850-518) removes residual filler from the surface but leaves the pores filled (right).*

the pad, wet it with a little alcohol first and then add the shellac, which becomes slightly diluted. Go over the wood with the pad once or twice but no more. When dry, sand lightly with P320-grit sandpaper or a gray abrasive pad, and clean the surface and pores thoroughly with a vacuum.

In the past, most commercial paste fillers were made with quartz as the main filling component. Many fillers on the market today contain cheaper and, in my opinion, less-effective ingredients. Sherwin-Williams still uses 100% quartz, but it's sold only in gallons. Pore-O-Pac uses some quartz, but is cheaper and comes in quarts. Both these fillers are oil-based, which I find easier to apply and control than water-based filler.

In either case, buy the uncolored or "natural" filler; it enables you to customize the color to suit the wood. Stir the filler thoroughly to get the solids off the bottom. Pour some filler into a small container and add mineral spirits to get it to the consistency of heavy cream.

The filler's color is a matter of personal choice. I like the pores somewhat darker than the lightest part of the wood, but not dark enough to make them stand out. For this project, I added equal parts of burnt umber and Van Dyke brown artist's oils. I first mix the pigment with some mineral spirits and a portion of the filler. This way, when I mix the color concentrate into the filler, they will readily incorporate.

On large, flat surfaces, apply the filler with a pad, squeegee, or brush, working in small sections. For carved or curved surfaces, use an old brush and apply filler sparingly. For this bookcase, I filled all the outside surfaces (except the back) and the tops of the shelves.

As the solvent evaporates and the filler begins to dry, it will change from shiny to dull. Run a plastic scraper across the surface, slightly diagonal to the grain, to see if the surplus is ready to be scraped off. If it hasn't set enough, it will be slightly runny. If it's too dry, it will come off in flakes. When it rolls up in wrinkles onto the scraper, it's just right.

You need to get all the filler off the surface or the residue will show through the topcoat as unattractive gray spots. After removing the bulk of the surplus with the scraper, wait

Photos: Mark Schofield

4 TWO OPTIONS FOR TOPCOATS

SHELLAC IS FAST AND EASY



End with shellac. *A few thin coats give the filled mahogany a beautiful glow. This can be done with a pad or a brush.*

VARNISH ADDS PROTECTION





Two coats of varnish over the shellac will protect the top of the bookcase from spilled liquids.

Rub out varnish for a low luster or a high gloss



Low-luster look. *After the varnish has cured, you can rub the surface with 0000 steel wool. Then apply a coat of paste wax, wait 30 minutes, and buff the surface with a soft cloth.*







For a glossy surface. *First sand away any dust nibs using 600-grit (CAMI) paper lubricated with water (top). Then use an automotive compound to rub the surface to an even shine before applying wax (above).*

about 10 minutes (less on a hot, dry day), and then do the second removal. Wiping the surface with burlap is the traditional way, but I prefer a white woven pad. Again working slightly diagonal to the grain and using moderate pressure, remove the filler left on the surface. As the pad starts to load, switch to a clean section. I also use the pad to remove all the surplus filler from the moldings. The object is to remove only the surplus, not pull filler out of the pores.

When finished, wait about an hour and inspect the surface. If there are areas not completely filled, reapply the filler. If everything looks good, lightly wipe the surface with a dry cotton rag going with the grain. If there's any dried filler on the surface, lightly dampen the rag with mineral spirits to rub it off. When the rag comes up clean, all the filler is removed.

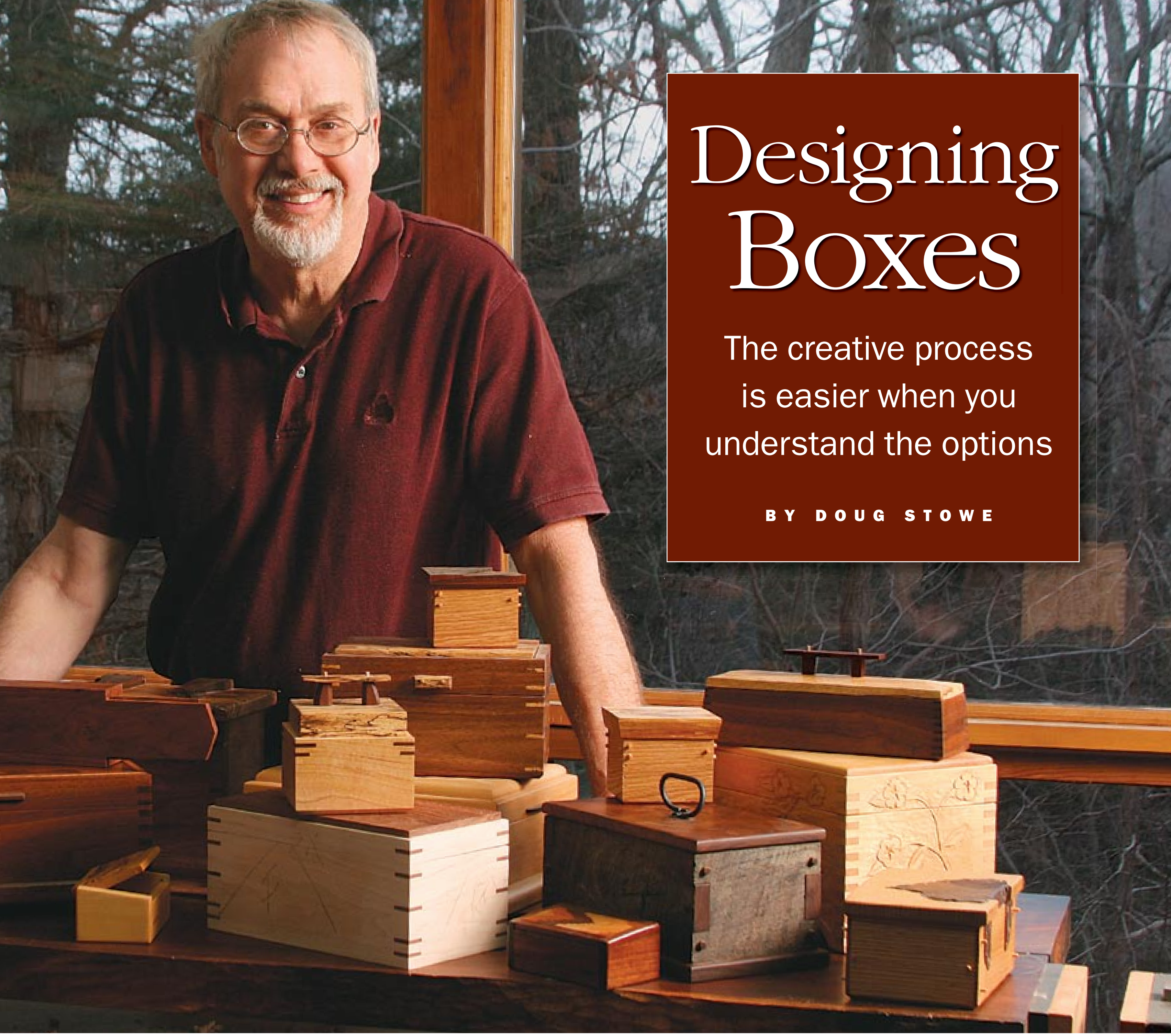
Two topcoats for one piece

I give filler at least two days to dry, longer if necessary, before applying a topcoat. If the piece smells of oil, wait.

For this bookcase, I again reached for the SealCoat to be the body of the finish and applied it with a pad. You only need to go over the surface a few times for an effective finish. This is where filling the pores fully pays off. You can keep the coating thin, maintain a close-to-the-grain look, and still have the wonderful glow that shellac produces on a smooth surface. I brushed the interior with a couple of unthinned coats of SealCoat.

To give the top added protection and water resistance, I used an alkyd varnish such as Pratt & Lambert's 38. I used a foam brush to apply two thin coats, lightly sanding between the coats. Once the varnish has cured for a few weeks, you can refine it by rubbing it out. For a soft sheen, rub the surface with 0000 steel wool going with the grain., and then apply some paste wax. For a higher sheen, lightly abrade the surface with some 600-grit (CAMI) wet-and-dry sandpaper lubricated with water. Then rub the surface with a fine-cut automotive rubbing compound, and finally, apply some paste wax. □

Peter Gedrys is a professional finisher in East Haddam, Conn.



Designing Boxes

The creative process is easier when you understand the options

BY DOUG STOWE

I've been making boxes for over 30 years. Indeed, I've made thousands of them and I hope to make a few thousand more in the years to come.

I can't cover decades of box-making knowledge in a single article, but I can share some of the things I consider when designing a box—wood, corner joints, lid, bottom, feet, pulls, and dividers. Armed with a few good options for each element, you'll have no trouble designing all sorts of beautiful boxes on your own.

Box making appeals to me for many reasons. I enjoy the process of design. And because boxes come together more quickly than many other woodworking projects, I have more opportunities to try new designs and learn new woodworking techniques. Consider, too, that you can make a box from bits of lumber left over from larger projects, so wood costs are minimal.

Not only can they be beautiful to look at—masterpieces in miniature—but boxes are perfect for storing everything from jewelry to stamps, and keepsakes to odd change.

Doug Stowe lives in Eureka Springs, Ark. His latest book and DVD is Basic Box Making (The Taunton Press, 2007)

Online Extra

Watch a video of Stowe resawing and mitering wood at **FineWoodworking.com/extras.**

Photos, except where noted: Michael Pekovich; this page: Tom Begnal

Contrast adds interest

Unlimited design possibilities open up when you vary the texture and color of the wood or introduce contrasting materials such as stone, metal, or fiber.

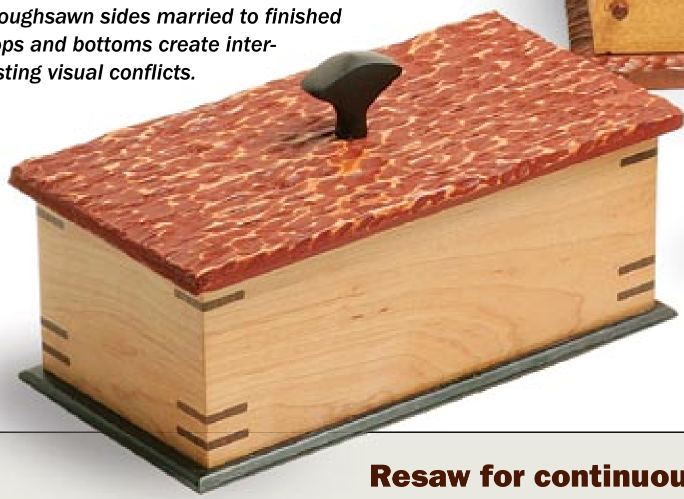


Mix the woods. *Stowe often makes the sides and top from two different woods, playing with the contrast in color and grain.*



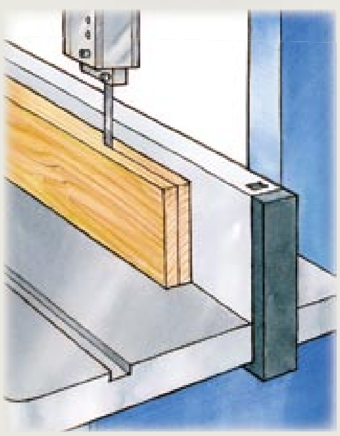


Vary the texture. *Don't be afraid to explore different textures. Knots, knotholes, and live edges accentuate the natural look of the wood. Rough-carved surfaces encourage both looking and touching. Roughsawn sides married to finished tops and bottoms create interesting visual conflicts.*

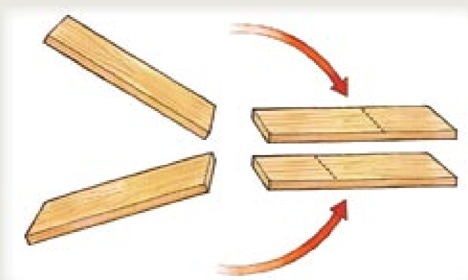


Resaw for continuous grain

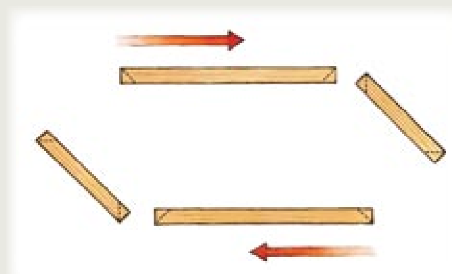
I like small boxes to have thin sides, in proportion with the overall scale. Rather than running stock through a thickness planer and wasting a lot of beautiful wood, I get thinner stock by resawing. Resawing also means I can get all of the parts for a box from a single board, with matching grain at all four corners.



1. On the bandsaw, resaw stock to produce a pair of book-matched halves.



2. Open the halves to put the resawn surfaces on the outside of the box. Cut at the dotted lines to create four sides.

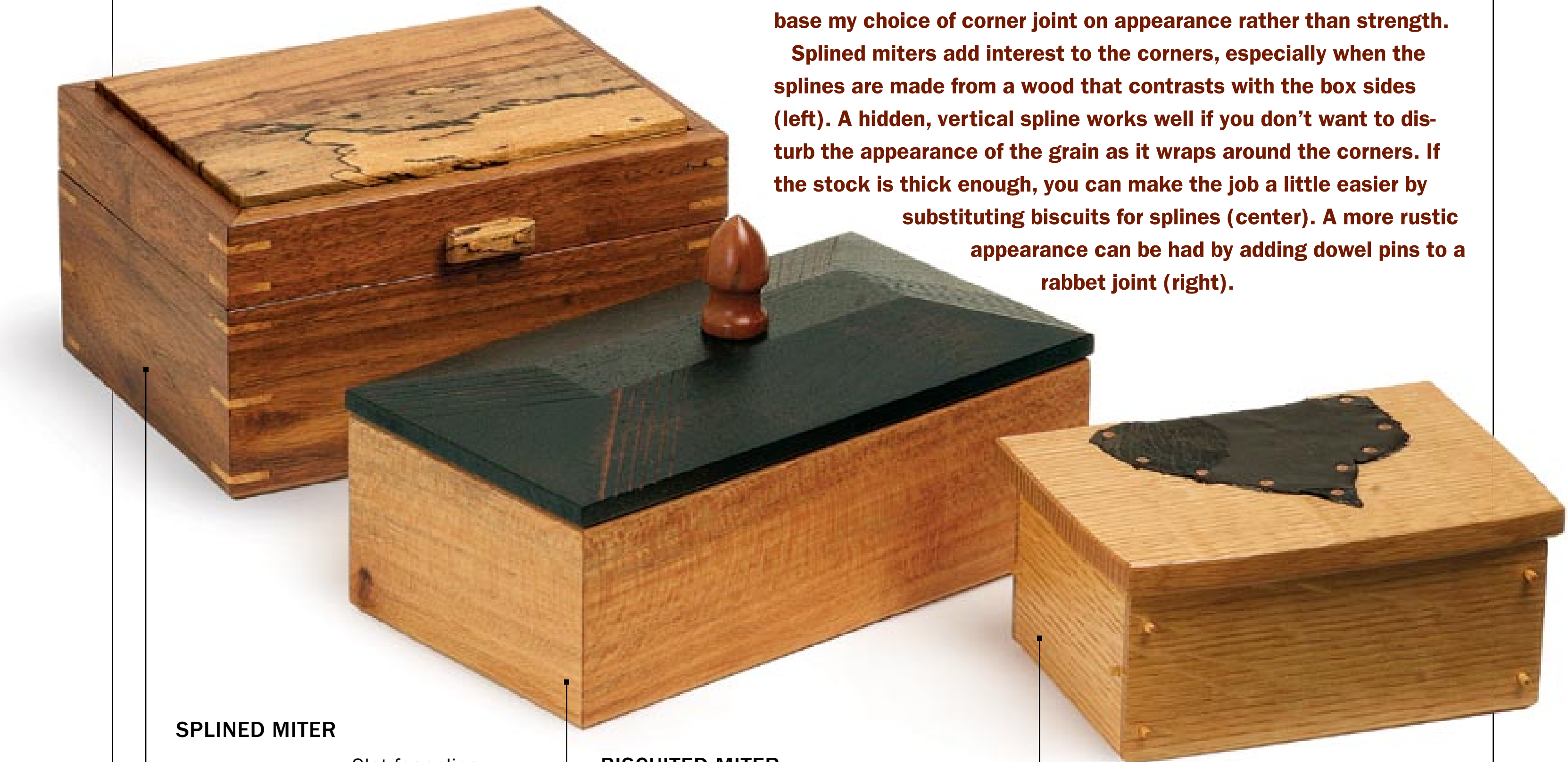


3. Then miter the ends and assemble the box as shown for continuous grain around all four sides.

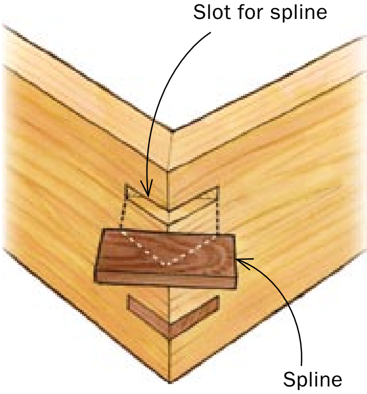
Choose corner joints early on

Most corner-joint options are more than strong enough to hold together a relatively light box. And joints with minimal strength, like butt joints and miter joints, are easily reinforced. So, most times, I base my choice of corner joint on appearance rather than strength.

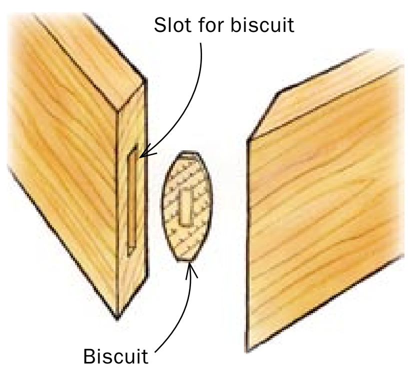
Splined miters add interest to the corners, especially when the splines are made from a wood that contrasts with the box sides (left). A hidden, vertical spline works well if you don't want to disturb the appearance of the grain as it wraps around the corners. If the stock is thick enough, you can make the job a little easier by substituting biscuits for splines (center). A more rustic appearance can be had by adding dowel pins to a rabbet joint (right).



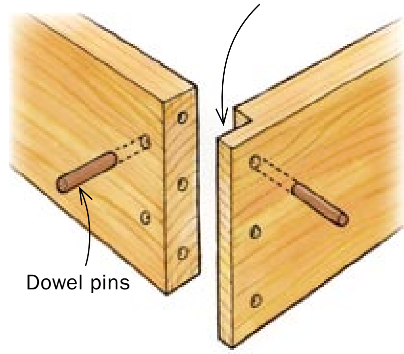
SPLINED MITER



BISCUITED MITER



PINNED RABBET





Traditional favorites

The classic dovetail joint (left) never goes out of style. Feel free to vary the dovetail angle and spacing to get the look you want. Finger joints (right) are also eye-catching, and easy to make on the tablesaw using a shopmade crosscut jig.

Drawings: Stephen Hutchings



Rounded disk. *A single countersunk screw driven through the bottom of the disk secures it to the corner of the box.*



Cutaway sides. *By cutting away the bottom edge of the sides, the box effectively ends up with four feet.*

Don't overlook the feet

Add feet to a box and you immediately create a different look. Feet can be as unassuming as small, rounded disks (top left). You also can make feet simply by cutting away some of the bottom edge of each side (bottom left), or mounting the box to a mitered base frame with the bottom edge cut away (top right).

Sometimes, to give a box a more balanced look, I make an oversize bottom (bottom right) that gives the look of a continuous molding around the perimeter. Generally, I simply round over the edges of this base, and attach it with screws to the bottom edge of the sides. Oversize holes for the screw shanks allow the base to expand and contract in width due to seasonal changes in humidity. Countersink the screw holes so they sit just below the surface.



Cutaway base frame. *Cutting away the bottom edge of a base frame also produces feet.*



Oversize flat bottom. *An oversize flat base creates the look of a molding around the bottom of the box.*



It pays to plan. *If you're building a box for a specific use, plan any dividers and trays early in the process. Their size, number, and location will have a lot to do with the ultimate size and shape of the box.*

Dividers and trays add versatility

Some boxes become more useful when you add dividers or trays. A box I make for holding stationery (left) has a sliding tray with three routed recesses for stamps and paper clips, plus a groove to hold a favorite writing pen. My jewelry box (below left) has a fully divided bottom with additional dividers in a sliding tray. A keepsake box (below right) has a mix of six small and three large compartments.







Two-part lid. *Stowe used shop-made wooden hinges here. The hinge pins are brass.*

Sliding. *You open and close the top on this pencil box by sliding it.*

Rabbeted lift-off. *Gravity holds this lid in place. A rabbet around the underside of the lid keeps it centered.*

Lid choices abound

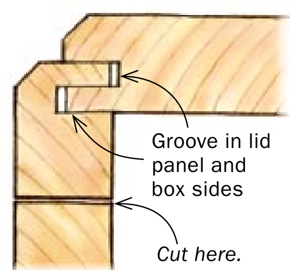
Design possibilities soar when you start thinking about the lid. Choices include two-part lids (top left), sliding lids (center left) and rabbeted lift-off lids (bottom left).

Lids can be made from a single piece of solid wood or some variation of a frame and panel. I commonly use an overlapping raised panel that locks into the sides of the lid (below right).

Space inside the grooves allows room for wood movement caused by seasonal changes in humidity. To allow that movement, it's important not to glue the panel in place.



RAISED PANEL



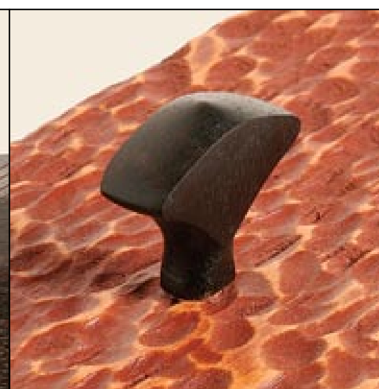
Sawn off. *The top, bottom, and sides are assembled, then the lid is cut off about 1 in. below the top edge.*

A pull can push the envelope

A well-designed pull looks good while making it easier to open a box. Shown here are some of my favorites. There are as many possibilities as there are types of boxes, so don't restrict yourself to only these designs. Add a little imagination and soon you'll be inventing your own.



Turned. *Small lathe turnings make wonderful pulls. A single brass screw holds each one in place.*



T-shaped. *This profile quietly invites the thumb and forefingers, and is good for heavier lids.*



Fan-shaped. *Rounded and softened edges give this pull a delicate look that works nicely with lightweight lids.*

Hinges, from hidden to handmade

Sliding and rabbeted lift-off lids can become awkward to use when boxes get around 12 in. square or bigger. At that size, I generally find that hinged lids work better.

Depending on the box design, there are several hinge types that I commonly use. Each type adds a distinctive look.





Wood. *Shopmade hinges add to the handmade appeal. The flat version (above) is screwed from the bottom. Wood pins secure an L-shaped hinge (right).*





Leather. *Three pieces of leather—two end pieces and a center piece—are secured with brass tacks to create a unique hinge.*

Specialty hinges



A butt hinge (left) with a built-in stop at 95° lets the lid tip back enough to keep it from falling closed (www.brusso.com). Barbed hinges (below) slip into thin kerfs. They need no screws and are almost invisible (www.rockler.com).









Bent-wire. *A single bent wire gives a unique look. This one is from Horton Brasses (www.horton-brasses.com).*



Flat. *Flat stock doweled to a pair of posts adds an Asian flavor. Scale the size up or down depending on the box dimensions.*



Front-mounted. *Mounted to the front of a hinged lid, the pull serves as a lifting point.*



Live-edge. *The natural curve of a live edge works perfectly as a lift for some boxes.*

Tapered Laminations Made Easy

A single jig tapers the plies on the bandsaw and then guides them through the planer

BY MICHAEL C. FORTUNE



Bent and split. *Fortune sawed into the tops of these bent, tapered legs to insert stretchers.*



Incorporating tapered, curved laminations in your furniture opens up an incredible range of designs. However, tapering the component after it has been laminated has two disadvantages. If too many gluelines are broken, then the part will begin to straighten. Also, the severed gluelines are likely to show as a series of ugly lines.

A better way is to taper the individual plies, so that when they are glued together, both the inside and outside curves are continuous wood with no disfiguring gluelines. I have a jig that makes creating tapered plies a snap. It works not only to cut the tapered plies on the bandsaw, but also to clean them up on the planer.

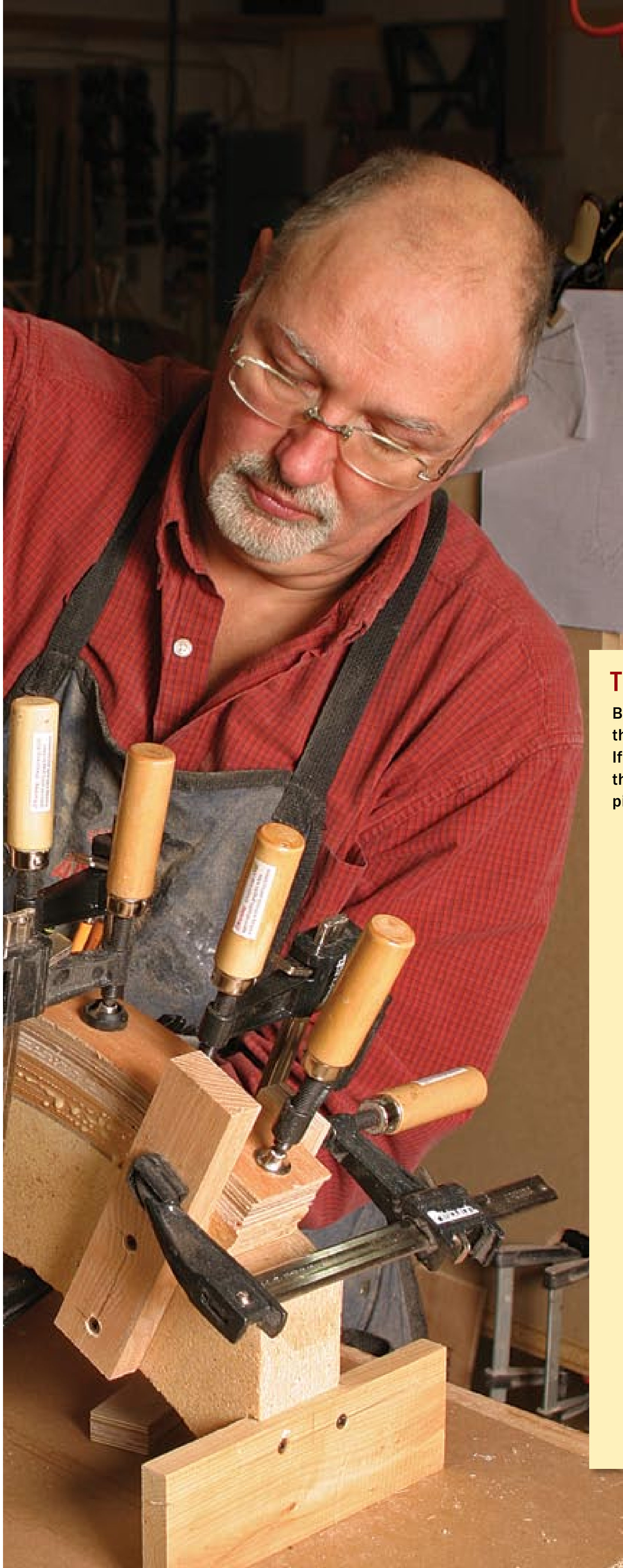
Determine the dimensions of the plies

After creating a full-scale drawing of the piece, the first step is to figure out the number and thickness of the plies. This is a balancing act: The bond between thick, curved plies with only a few gluelines might weaken, letting the part slowly straighten, a process known as "cold creep." Conversely, too many plies introduces too much glue, increasing the risk that the piece will contract or warp as it dries. As a guide, a 1-in.-thick laminated part bent around a 12-in. radius should comprise about 10 plies. You should be able to bend the plies around the form by hand; if not, make them thinner and add more.

When calculating the number of plies, start at the thin end of the finished part, maintaining a minimum



Mitered together. *He made each leg from two tapered, laminated parts mitered together along their length. A miter reinforced with loose tenons joins legs to aprons.*



thickness of 1⁄16 in. at the tapered end of each ply. Any thinner and they may not survive being passed through the planer. Then divide the thick end by the number of plies to get the maximum thickness of each ply. I recommend making the plies ¼ in. wider than the finished part, and 1 in. longer (measured along the outside of the lamination) at both ends, to allow for cleanup and final sizing.



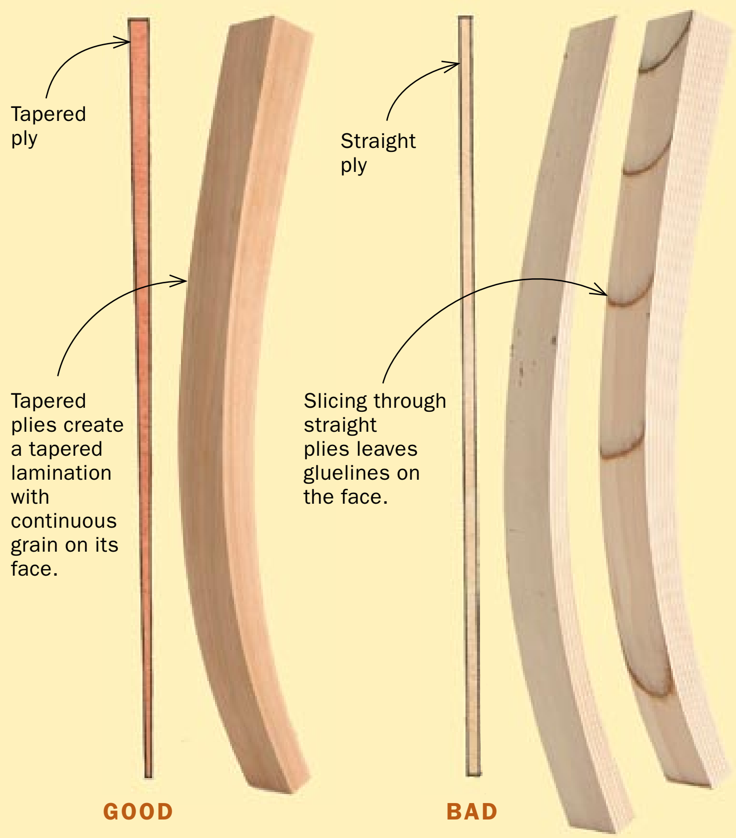
Graceful chair. *Fortune used bent, tapered laminations for the legs and stretchers of this armchair.*

Make the bandsaw/planer taper jig

The dimensions of the jig can be changed to suit the project. I've used these jigs for making tapered parts from 1 ft. to 14 ft. long. Make the jig 2 in. longer at each end than the length of the plies. This 2-in. space accommodates end stops on the jig and any planer snipe. Make the jig wide enough to accommodate your plies, but be aware that the width of the jig is limited by the resaw

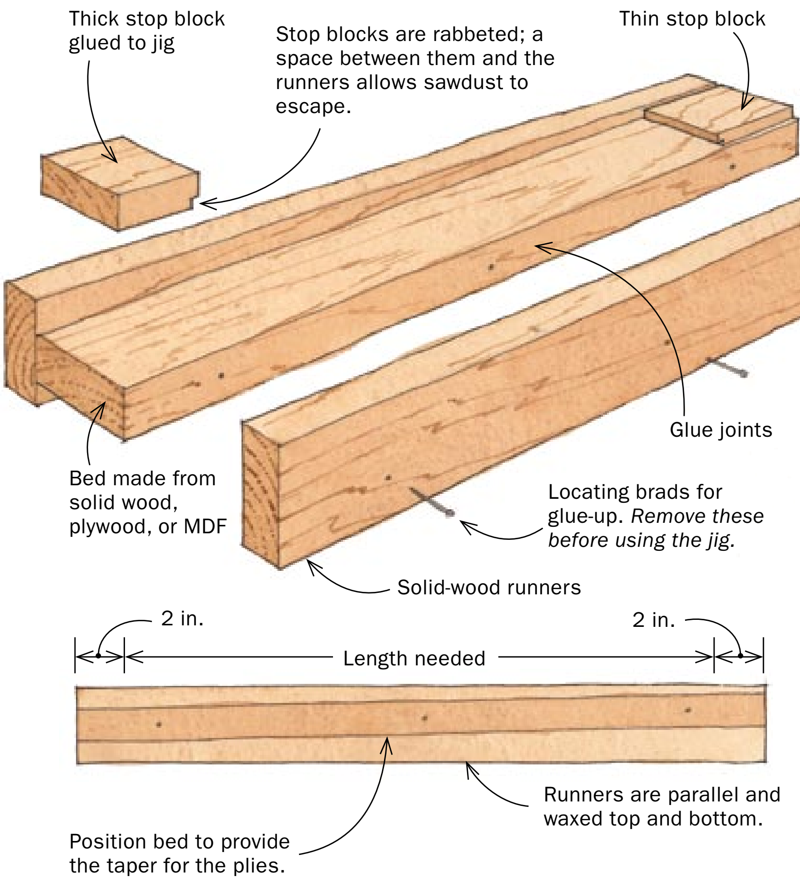
TAPER THE PLIES FOR A CLEAN LOOK

By tapering the individual plies before they are glued into a lamination, the tapered outer surfaces remain solid with no visible gluelines (left). If you taper the piece after it has been laminated, you will cut through the gluelines, spoiling the appearance and potentially weakening the piece (right).



Make the tapered plies

BANDSAW AND PLANER TAPERING JIG



capacity of your bandsaw. The jig is made up of three pieces: two solid-wood parallel runners (¾ in. thick is best) and an inclined solid-wood or plywood bed that provides the taper. The three pieces should be jointed and planed as straight as possible.

Two inches from each end of the runners, carefully measure down from the top edge and mark the thin dimension of the ply on one end and the thick dimension on the other. Draw a line connecting the two points. Align the top surface of the bed with this line and clamp the parts together without glue. Drive in two or more small finishing nails on each side so that they penetrate the bed by ⅛ in. Leave the nail heads proud so they can be pulled out later.

Separate the parts, apply glue, and reassemble them, aligning the nails in the holes to stop the parts from sliding as clamps are applied. Remove the nails when the glue is dry.

Position the end stops so the blank just slips in and out between them. If more than one blank is involved, all must be cut to the same length. To keep sawdust from accumulating and affecting the fit, the stops are rabbeted on the inside with space on either side next to the runners.

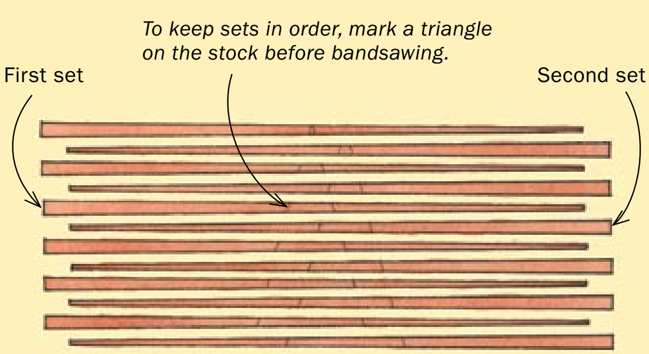
Set up the bandsaw and make tapers

Make sure your bandsaw is tuned up and ready for resawing (see "Five Tips for Better Bandsawing," *FWW* #173). Set the fence so that the blade is 1⁄32 in. to the right of the jig and cutting paral-

BANDSAWING



Stop blocks secure the blank. *On either end of the jig, glue and clamp a stop block. You should just be able to slip a piece of paper in between the blank and each stop block.*





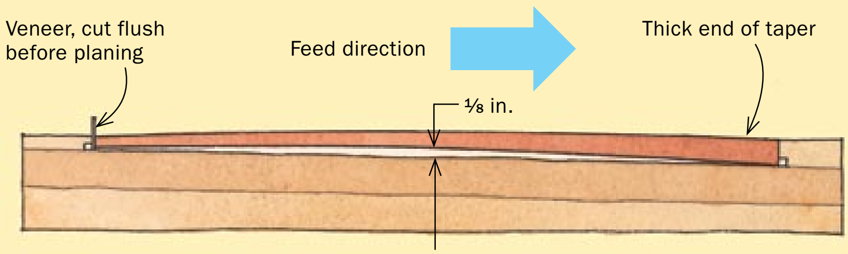
Two sets of plies. *After cutting each tapered ply, joint the face, flip the blank end over end, and cut the next one. Note the simple guide platform that keeps the workpiece level.*

PLANING





Run each ply through the planer. *Glue a piece of veneer to one stop block (left), causing the ply to bow upward about 1/8 in. When pushed down by the infeed roller of the planer, this bow greatly reduces the risk of the ply being picked up and shredded by the planer knives. With straight-grained wood, feed the thick end of the ply into the planer first (above) so that the knives are cutting downhill and not against the grain.*





One board, two sets of plies. *After planing the plies, use the triangle drawn on the original blank to stack the two groups in their correct sequence for grain-matched laminations.*

lel to the fence. If both runners don't contact the fence, attach a taller auxiliary fence. Bring a guide platform with a small cutout around the blade up to the jig and attach it to the bandsaw table. This can be done with double-sided tape, or with screws set into a block of wood clamped to the edge of the table. The platform helps to support the blank while it is carried past the blade. For this reason, the thickness of the platform should match that of the jig's runners. The guide platform should extend beyond the front and back of the blade by a little over half the length of the blank. When cutting long plies, the ends of the platform can rest on adjustable stands.

The tapered plies are cut from a blank of solid wood. It is a good idea to draw a triangle on the top surface of the blank to keep the laminates in order.

The blank must be flipped end-for-end each time a tapered ply is cut away. If not, the thick end of each ply comes from the same end of the blank, and the blank becomes increasingly tapered. You will quickly run out of wood on one end of the blank, and each successive ply will have more and more weak cross-grain. The blank should be wide enough to provide enough plies for at least two packets of laminations.

Place the blank in the jig (triangle pointing up) and run it through the bandsaw. The thick stop should be toward you so the blank is less inclined to slip off. After each pass, lightly joint

Drawings: Jim Richey; furniture photos on pp. 68-69: courtesy of Michael C. Fortune

Glue-up

the bandsawn face of the blank, then flip it end-for-end so the triangle is pointing down, reinsert it in the jig, and cut another taper. Pile the tapered plies in these two groups according to the triangle marks as they come off the bandsaw.

Shim the plies and run them through the planer

The bandsaw leaves surfaces too rough for making tight glue joints, so you'll need to plane these surfaces smooth. Glue a piece of veneer or thick card to the face of the thicker end stop on the jig. When inserted, the plies should bow up about ⅛ in. at the center point. The infeed roller on the planer will press the bow flat, which in turn will jam the ply against the end stops, greatly reducing or eliminating shredding. The 1⁄32-in. gap you set between the jig and the bandsaw blade will provide enough material to plane before you get down to the tops of the jig's runners.

Install a ply in the jig, bandsawn face up. The thick end of the ply usually enters the planer first so that the grain slopes away from the rotating planer knives, reducing tearout. The exception is plies with crooked grain, so examine the grain first.

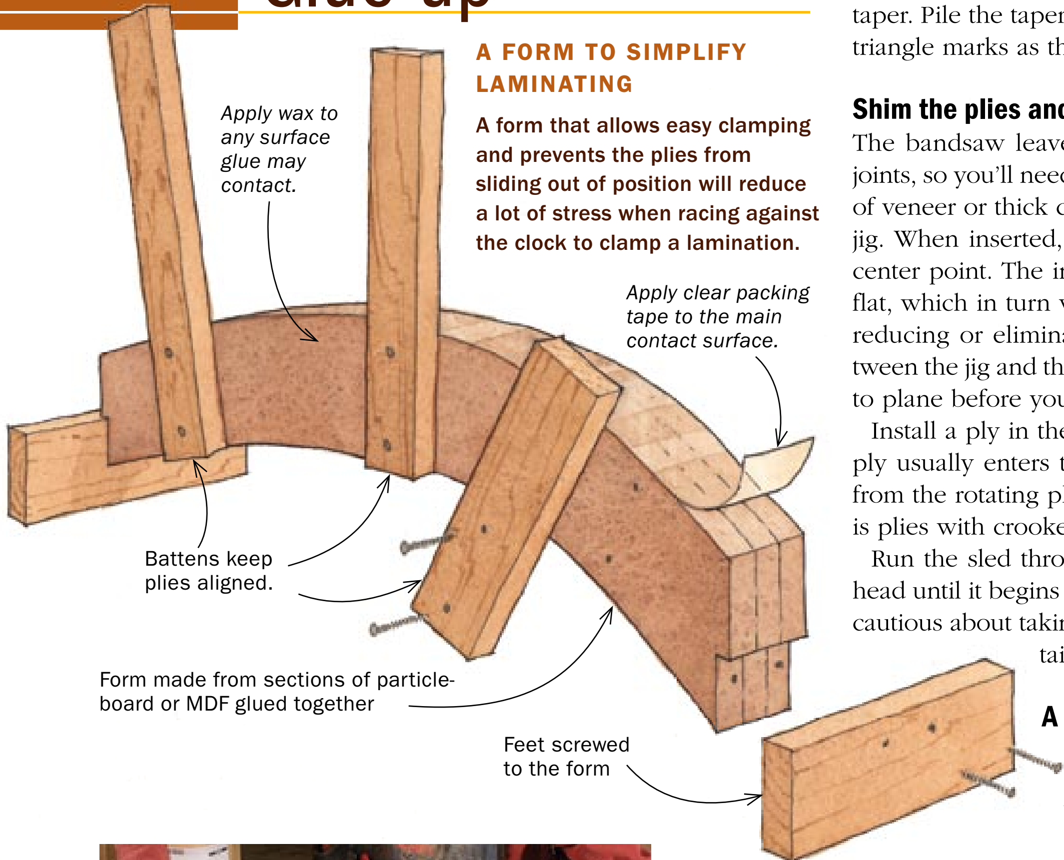
Run the sled through the planer, carefully lowering the cutterhead until it begins cutting the taper. One pass might do it, but be cautious about taking off too much material at once. Also, be certain that the plies retain their desired thickness.

A better form for bending

For all my laminating and steam-bending, I use a one-piece "male" bending form (the plies are bent over the form rather than into a concave

A FORM TO SIMPLIFY LAMINATING

A form that allows easy clamping and prevents the plies from sliding out of position will reduce a lot of stress when racing against the clock to clamp a lamination.





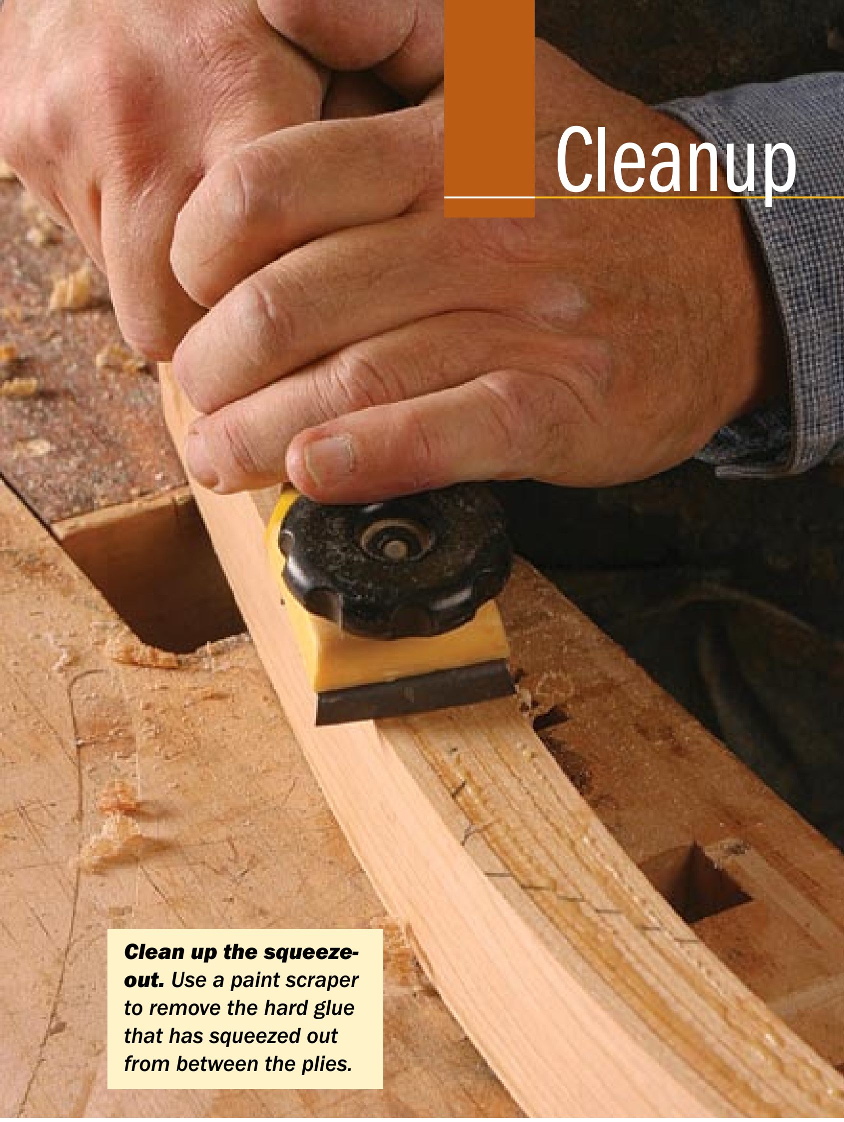
Apply the glue. *With a limited open time, it is important to apply the glue quickly. Tape the plies to a piece of cardboard and use a metal spreader with a serrated edge to apply an even coat of glue.*



Clamp from one end. *Place the plies and the packing strips on the form, and keep them parallel by clamping them to a batten (above). Then begin clamping them to the body of the form, working from one end to the other (right).*



Cleanup



Clean up the squeeze-out. *Use a paint scraper to remove the hard glue that has squeezed out from between the plies.*



Joint one edge. *Run the edge that was scraped across the jointer.*



Saw safely to width. *Using a bandsaw to rip the lamination to width is safer than using a tablesaw and risking kickback.*



Plane to thickness. *Run the lamination through the planer to remove the bandsaw marks and bring the lamination to final thickness. Trim the ends on a miter saw using a jig, or on the tablesaw using a sled.*

form) made from particleboard or medium-density fiberboard. The shape is bandsawn and the inside curve runs parallel to the outside so the clamps won't slip off. Attach battens long enough to guide the unclamped plies as they are brought around the form.

The form's surface should be smooth and true. You can either remove the bandsaw marks with a stationary disk or belt sander, or surface the face with a 1/8-in.-thick layer of Masonite, taking into account the extra thickness when designing the form. Cover the surface with packing tape, and apply paste wax to all the other parts of the form to resist glue adhesion.

Before you apply glue, do a dry run

Pressure radiates from a clamp's pad at about a 45° angle. To achieve uniform pressure but avoid having clamps placed almost next to each other, you need to position the clamp pads farther away from the workpiece so that the cones of pressure overlap. I use at least a 1-in.-thick stack of padding strips made from 1/8-in.-thick plywood, and apply packing tape to the face of the strip in contact with the plies.

For most woods I use urea/formaldehyde glue. Its rigidity and lack of cold creep make it ideal for laminations. I always do a dry-clamping run and time it to ensure I am within the adhesive's open time of about 30 minutes, depending on temperature. I use a metal mastic spreader with 1/32-in. curved notches stamped along the edge (Hyde Co., part No. 19120; www.hydetools.com). The notches deposit the perfect amount of glue (for veneer work, too), and the spreader is easy to clean with a damp cloth.

Tape the ends of the plies down to a piece of cardboard on a bench, paying attention to the triangle mark sequence. Leave aside the top piece, which isn't glued. Pour the glue onto the plies and spread it with the notched spreader. Draw the glue down the length of the plies to avoid forcing it between them.

On oily tropical woods I use an epoxy, applying the glue to both sides of each laminate. After gluing one face using the above procedure, I take the strips off the cardboard one at a time and glue the second side with a 2-in.-wide piece of spreader.

Gather the plies and the packing strips together and move the entire assembly to the form. Starting at one end, clamp the lamination to the batten, then clamp it to the form, and then repeat these steps until you reach the far end, alternating clamps front and back of the form. Let the lamination dry overnight.

Remove the dried glue from one face with a paint scraper, run that face across the jointer, and then finish the cleanup as shown in the photos above. You are now ready to use my mortising jig (see pp. 74-75) to do the joinery on these curved parts. □

Michael C. Fortune is a nationally recognized woodworker who lives near Peterborough, Ont., Canada.

Try This Versatile Mortising Jig

An adaptable clamping surface holds curved and straight parts alike

BY MICHAEL C. FORTUNE

One of the challenges when working with curved parts is how to cut joinery on them. When tapering solid stock, it's best to cut the joinery before cutting the taper, but this is not possible with laminated work, such as the bent, tapered laminations described in the previous article (pp. 68-73). A few years back, I created a simple jig that enables me to cut mortises in a variety of curved pieces. I've since discovered that the jig works equally well when mortising straight pieces, or cutting mortises in end grain.

The jig consists of a mounting block, a fixed vertical piece, and a sliding top surface. The mounting block is secured to the front edge of a workbench between two benchdogs. Alternatively, it can be screwed to a longer piece of plywood that is clamped to the top of the workbench.

It is important that the dadoes in the top surface and the mounting block are in matching locations to receive the ¾-in.-thick ultrahigh molecular weight (UHMW) plastic slide bars. The plastic and other hardware is available at www.rockler.com.

Lay out the mortise on the workpiece and then clamp it to the front vertical surface of the jig, touching the underside of the top. Now slide the top forward until the mortise is centered in the large viewing slot. Eyeballing it is sufficient, as once set up, the jig will cut matching parts identically. Now place the router on the jig and lower the bit until it just touches one end of the mortise. Slide the adjustable stop up to the base (round or square) of the router and tighten the wing nut. Repeat these steps at the other end.

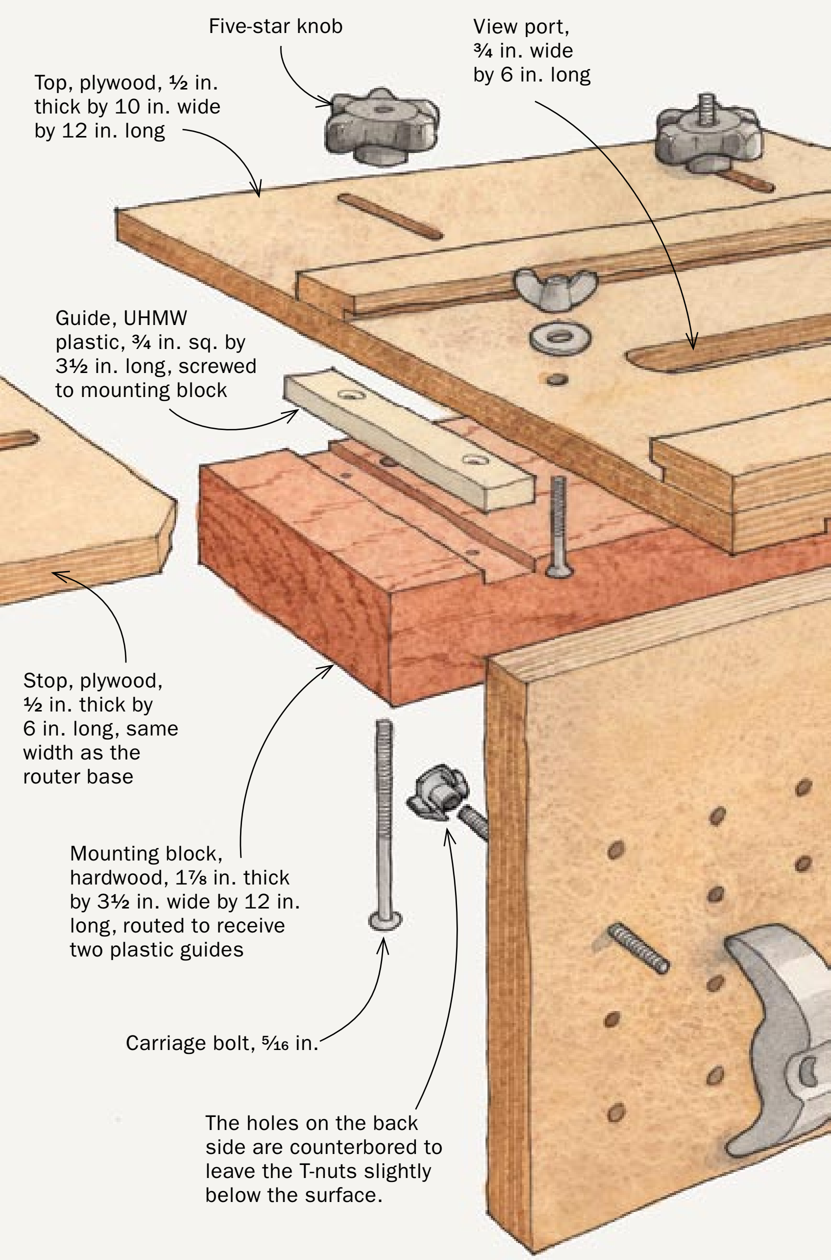
Although you can use any straight bit, I use two-flute (three- or four-flute bits won't plunge) high-speed end mills available at www.wttool.com. You will need to buy a collet adapter for the ⅜-in. dia. shaft. The bits work perfectly at 12,000–20,000 rpm. I plunge in a maximum ⅛ in. and do a medium-fast pass from side to side, not hesitating at the ends. The bit's spiral upcut design clears the chips from the mortise and a vacuum attached to the router removes them. □

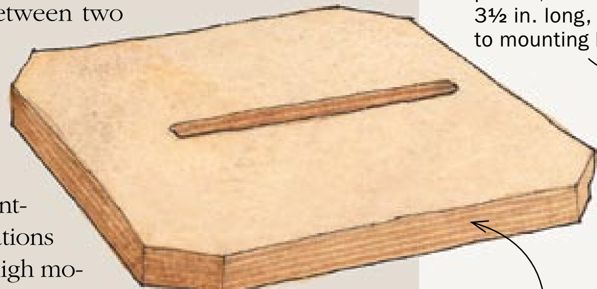
Michael C. Fortune is a woodworker near Peterborough, Ont., Canada.

Setup in 3 steps



Clamp the piece to the jig. *Center the mortise in the viewing port and tighten the hold-down clamps. If more than one piece is being cut, a stop block aids repeatability.*



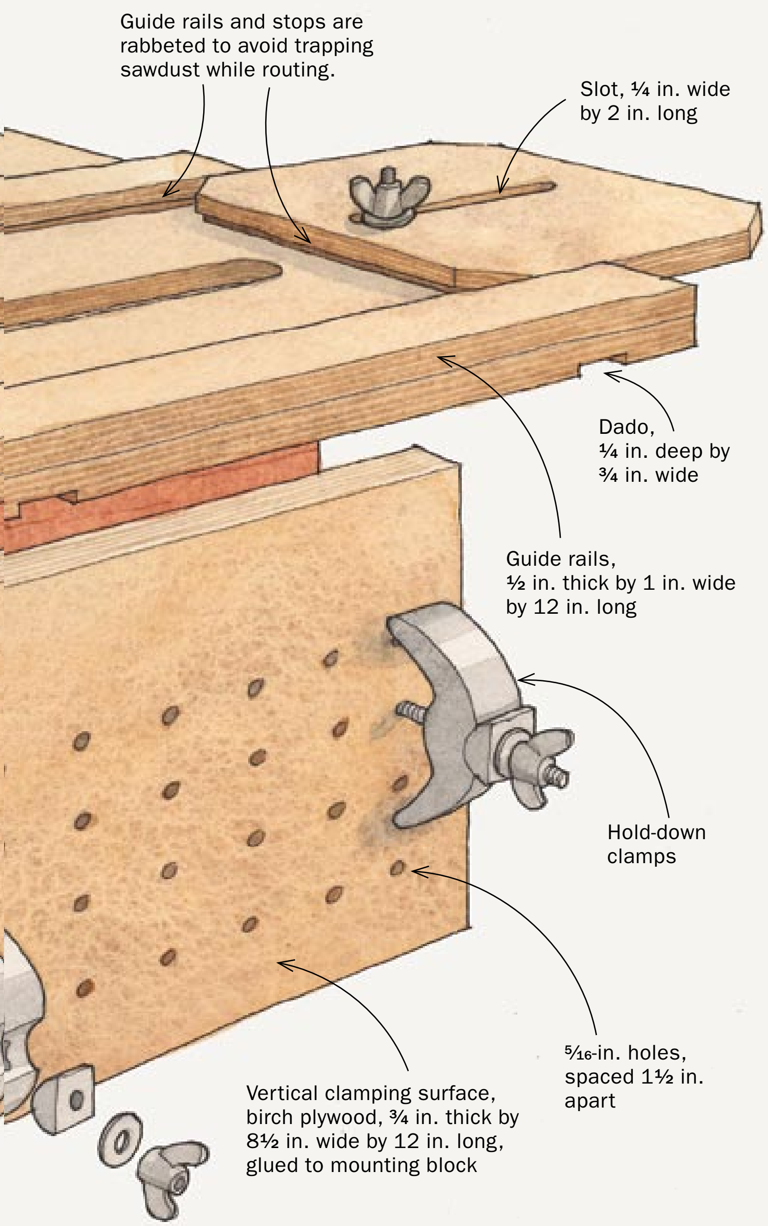


Photos: Michael Fortune; facing page (bottom right): Steve Scott; drawings: Jim Richey





Adjust front to back and side to side. *Slide the top so the view port is centered on the mortise (above). With the router bit just touching one end of the mortise (right), move the slide until it touches the router base and tighten the wing nut.*



Mortise 3 ways

On straight pieces. *With the workpiece secure and the jig aligned, use a straight-cutting bit to excavate the mortise, increasing the depth ⅛ in. with each pass. You can either square up the mortise with a chisel or use a rounded loose tenon.*





Into end grain. *The jig is flexible enough to allow end-grain mortises to be cut, such as for slip tenons.*



Curved pieces, too. *The jig allows clean, accurate mortises to be cut on all sorts of curved pieces.*



New Twist on a Sleigh Bed

Curved slats and simple carving make this bed stand out from the crowd

BY CHARLES SHACKLETON

In 1776, my great-great-great-grandfather (great-grandfather of the Antarctic explorer Sir Ernest Shackleton) started the Anna Liffey flour mill on the banks of the river Liffey near Dublin, Ireland. After I emigrated to Vermont in 1981 and started a handmade furniture business, I enjoyed returning to visit relatives who still lived in the old mill house. In their dining room, I spotted some beautiful chairs. Known as Irish fork-backs because of their X-shaped back slats, these chairs were a wonderful combination of simplicity and sophistication. I thought that with a few changes their classic design could translate into more contemporary pieces.

The chair I designed was very popular with customers, who requested other pieces like it, spawning a family of furniture I call the Anna Liffey range. This bed is a member of that group. Besides the X shapes, the bed has another subtle design



A design with Irish ancestry. *The X-shaped slats were inspired by old chairs Shackleton found in Ireland. He updated the look and incorporated it into beds, tables, and chairs like this one.*

Photos, except where noted: Mark Schofield; this page: Michael Pekovich

element, simple hand-carved curls on the ends of the legs, a whimsical trademark of my work. Making the bed requires a nice combination of machine work and handwork. To simplify the steps, I'll demonstrate several handy jigs and templates.

I prefer cherry for this bed because of its attractive color and grain, but walnut, maple, or mahogany would work as well.

The four legs are the foundation

Begin by creating templates for the legs on pieces of ⅛-in.-thick plywood. This will simplify laying out the legs on the 10/4 cherry, which has been flattened and milled to 2 in. thick. Try to get all four legs from the same board to keep color and grain uniform. If the board is at least 7 in. wide, it can be just over 8 ft. long.

Cut out the legs on a bandsaw. Next, use the leg templates to lay out the mortises for the side rails and the lower cross rails, and then cut them using a router, a drill press, or a hollow-chisel mortiser.

Remove the bandsaw marks on the curved parts of the legs using a bench plane, a compass plane, a spokeshave, or just sandpaper. Lay out and then carve the curl on the outside of each leg. All the other

Legs take shape



Lay out the legs. *Use plywood templates to lay out the legs on the 2-in.-thick cherry.*



Mortise the legs. *Use a hollow-chisel mortiser, a router, or a drill press.*

Carve a soft curl in 4 steps



1



2



3

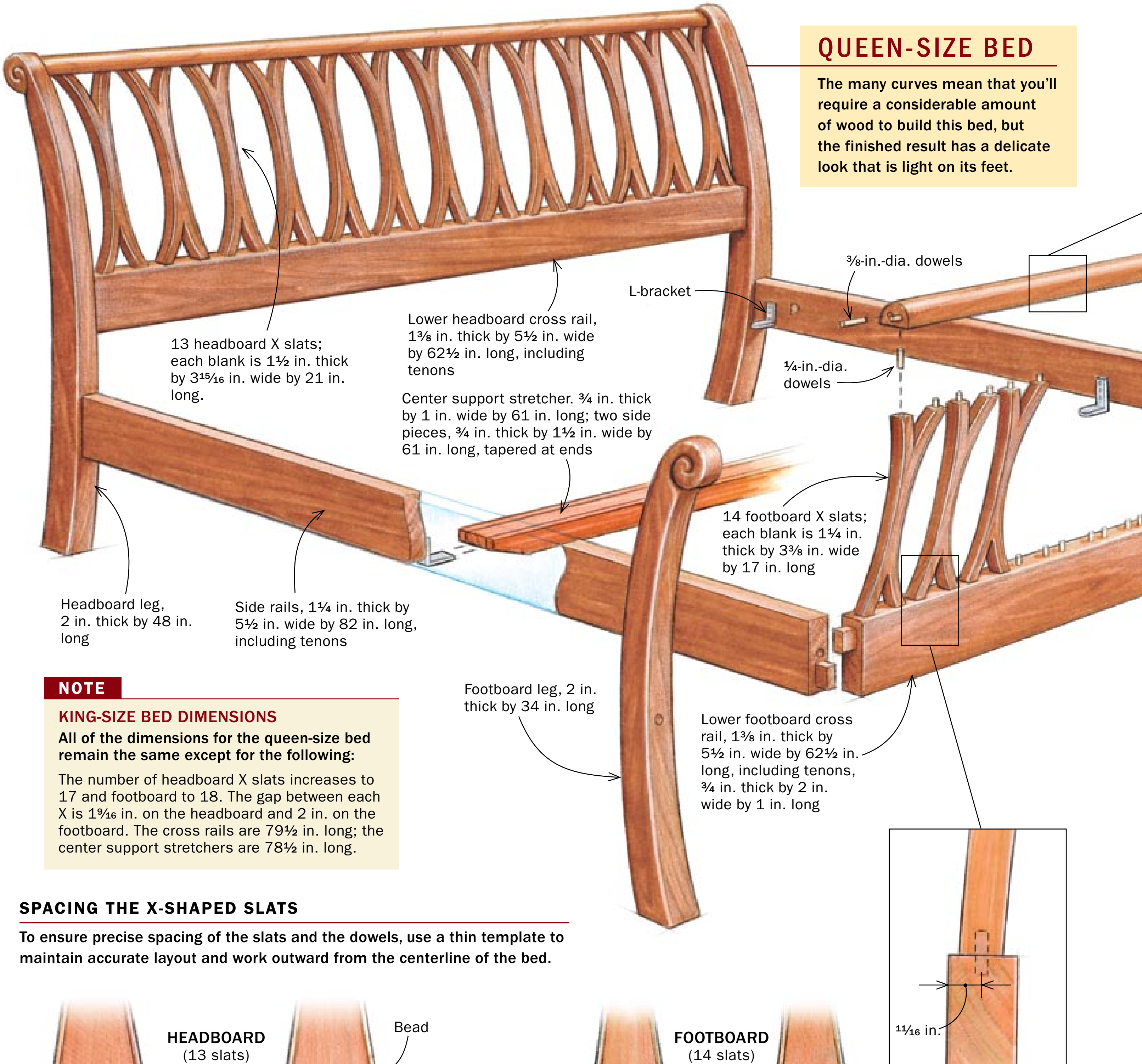
1. Lay out the curl. Design the template to match the sweep of the gouges you own, and then transfer the design to the leg.
2. Carve the curl. After making vertical cuts around the curl, come in from the side to relieve the design.
3. Round the edges. Use an inverted carving gouge to round over the outside edge of the leg and the sharp edges of the curl.
4. Clean up with sandpaper. It's a personal choice whether you want to leave the curl smooth or still showing the facets left by the gouges.



4

QUEEN-SIZE BED

The many curves mean that you'll require a considerable amount of wood to build this bed, but the finished result has a delicate look that is light on its feet.



NOTE

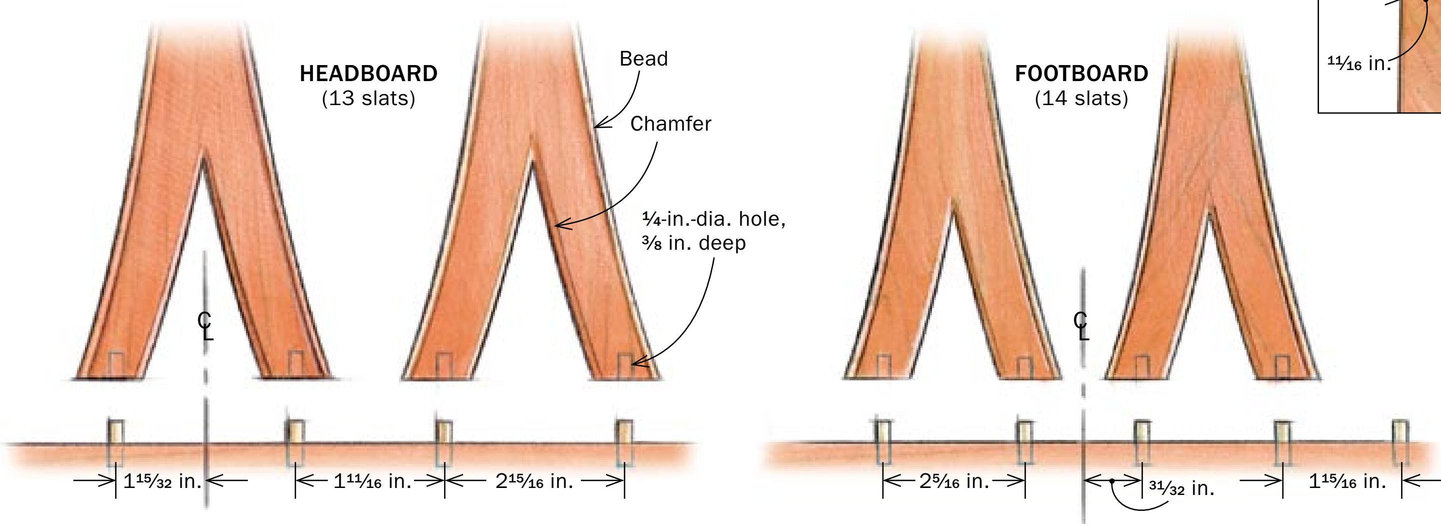
KING-SIZE BED DIMENSIONS

All of the dimensions for the queen-size bed remain the same except for the following:

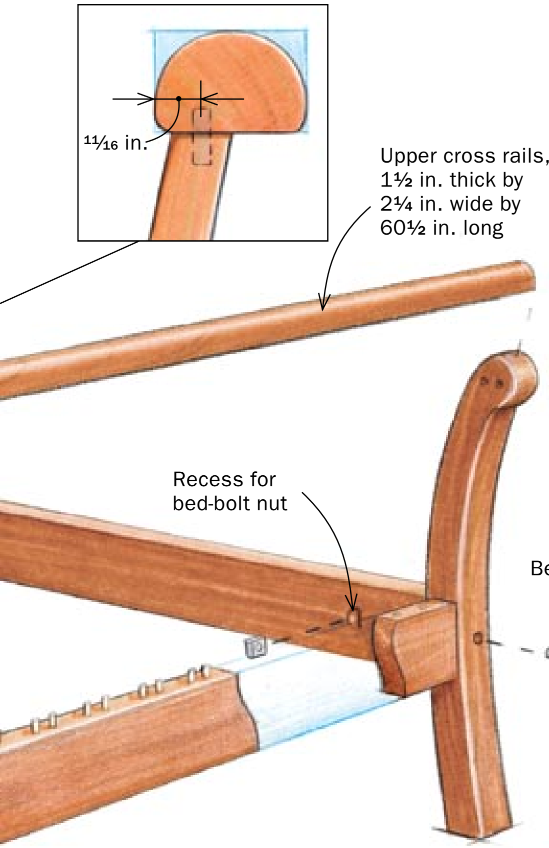
The number of headboard X slats increases to 17 and footboard to 18. The gap between each X is 1⁹⁄₁₆ in. on the headboard and 2 in. on the footboard. The cross rails are 79½ in. long; the center support stretchers are 78½ in. long.

SPACING THE X-SHAPED SLATS

To ensure precise spacing of the slats and the dowels, use a thin template to maintain accurate layout and work outward from the centerline of the bed.

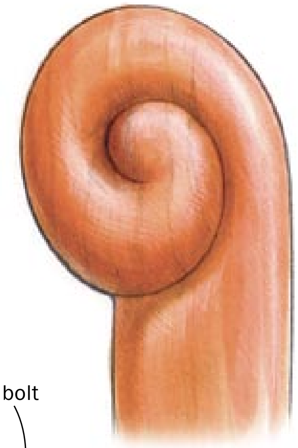


Drawings: Bob La Pointe



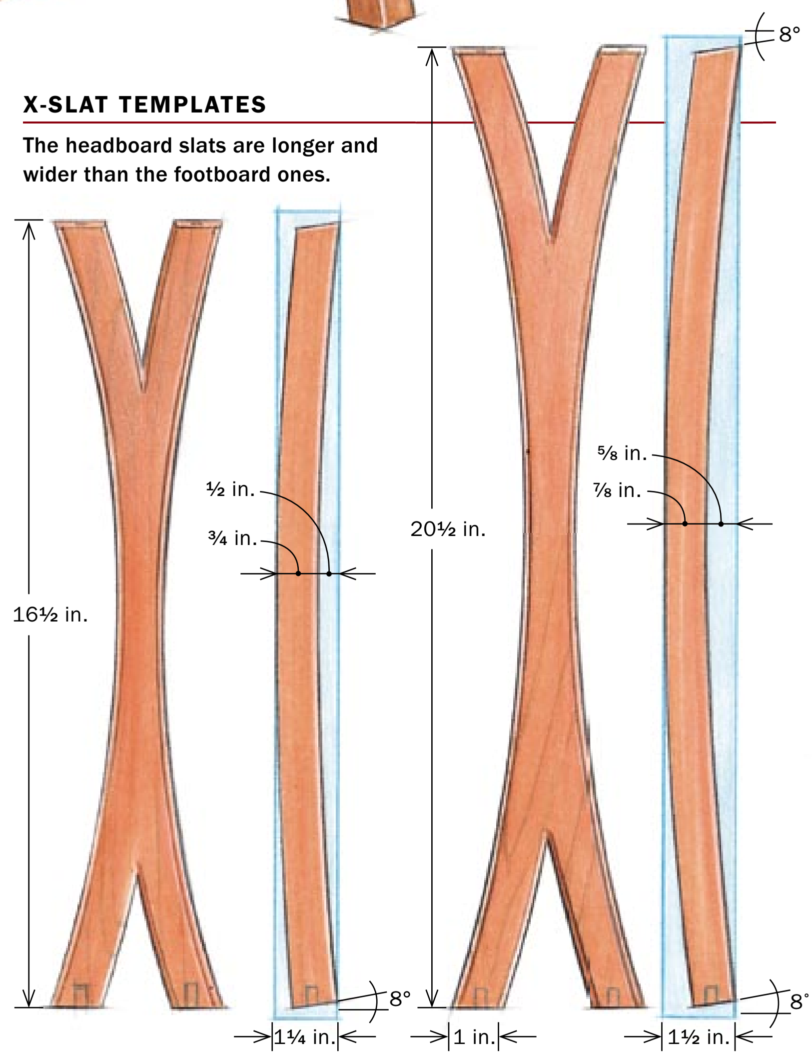
LEG CURL

Feel free to change the geometry slightly to match your carving gouges.

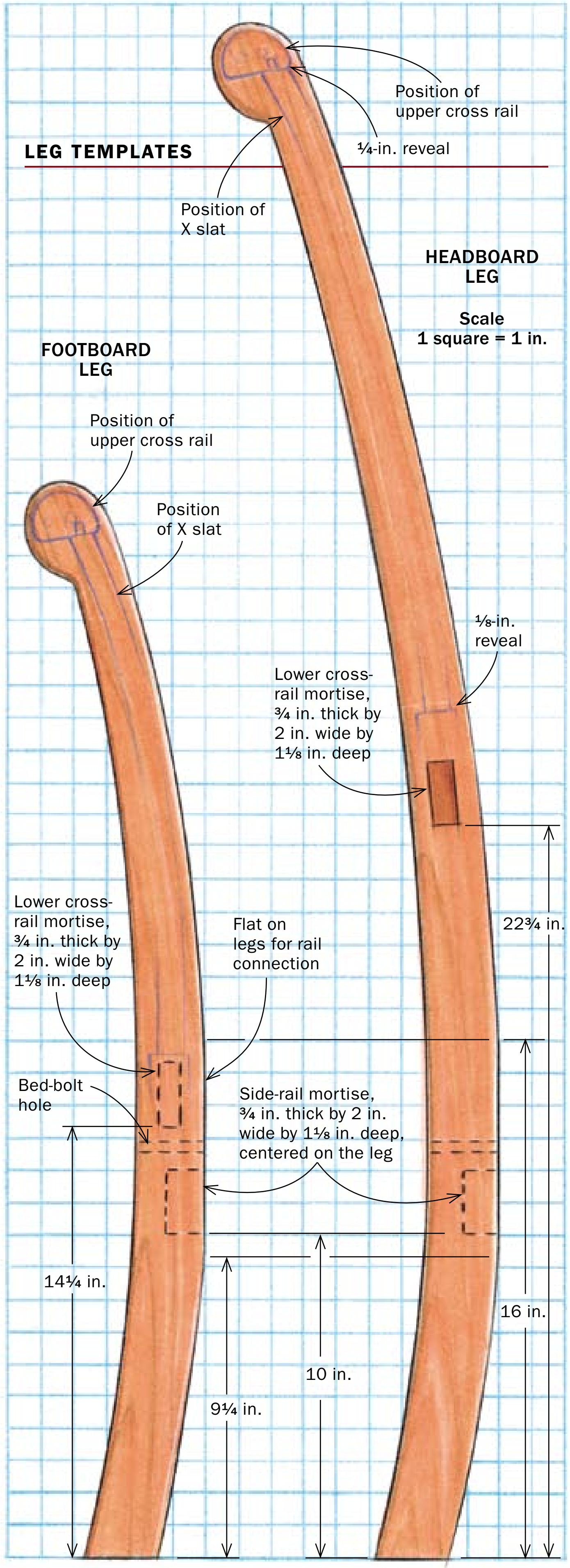


X-SLAT TEMPLATES

The headboard slats are longer and wider than the footboard ones.



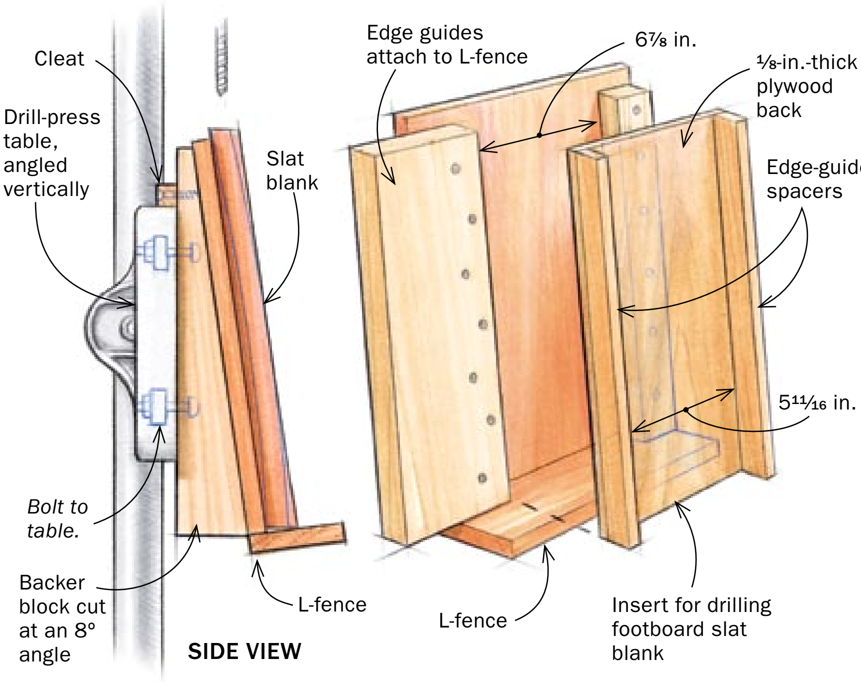
LEG TEMPLATES



Make the X slats

A JIG FOR ANGLED HOLES

The purpose of this jig is to drill dowel holes into the ends of the X-slat blanks at 8° to match the angle at which the slats meet the cross rails. Because the headboard Xs are wider than the footboard ones, an insert is placed in the jig when drilling the footboard Xs.





1. *Hold slat to right side of jig and drill.*

2. *Slide slat to left and drill second hole.*



Precision drilling. *If you lay out the rails carefully, and build an accurate jig for drilling the slats, the dowels will line up perfectly.*

corners receive a ⅛-in. roundover; the bottom of the leg gets a ¼-in. roundover. Last, sand the legs to P320-grit. This may seem excessive, but because I use a linseed-oil finish, it minimizes blotching on cherry.

Bandsawn and beaded, the Xs are dynamic and attractive

It may seem a complication to have different-size Xs for the headboard and footboard, but this keeps the two sections in visual harmony because the headboard is taller. Whether you are making a king- or queen-size bed, make a couple of extra blanks for both the headboard and the footboard X in case you damage one. Before you start, build the first of three simple jigs. This one (see drawing, above) bolts to a drill-press table tilted vertically and is used to drill holes at an 8° angle into the ends of the X blanks to receive the ¼-in.-dia. dowels. The jig is used with an insert when drilling each narrower footboard X, and without it for the wider headboard X.

Cut the blanks for the footboard and headboard Xs to their widths and thicknesses, but leave them about 1 in. long. On a miter saw or tablesaw, cut one end of

SHAPE THE X SLATS





Curve the slats. *Cut the curved side profile of the slats on the bandsaw (left). Then bandsaw the X design on each of the slats (above).*



Beading by router. *Simple jigs attached to a router base allow you to bead the Xs quickly and cleanly.*



Rails take shape

Shape the cross rails. *After drilling for the X-slat joinery, profile the top of the upper cross rails using a 1-in.-dia. roundover bit in a router table.*





Dowels connect rails to legs, too. *Drill 3⁄8-in.-dia. holes in each end of the upper cross rails (left). Insert dowel center points (above), and use these to mark the location of the holes in the legs (below).*

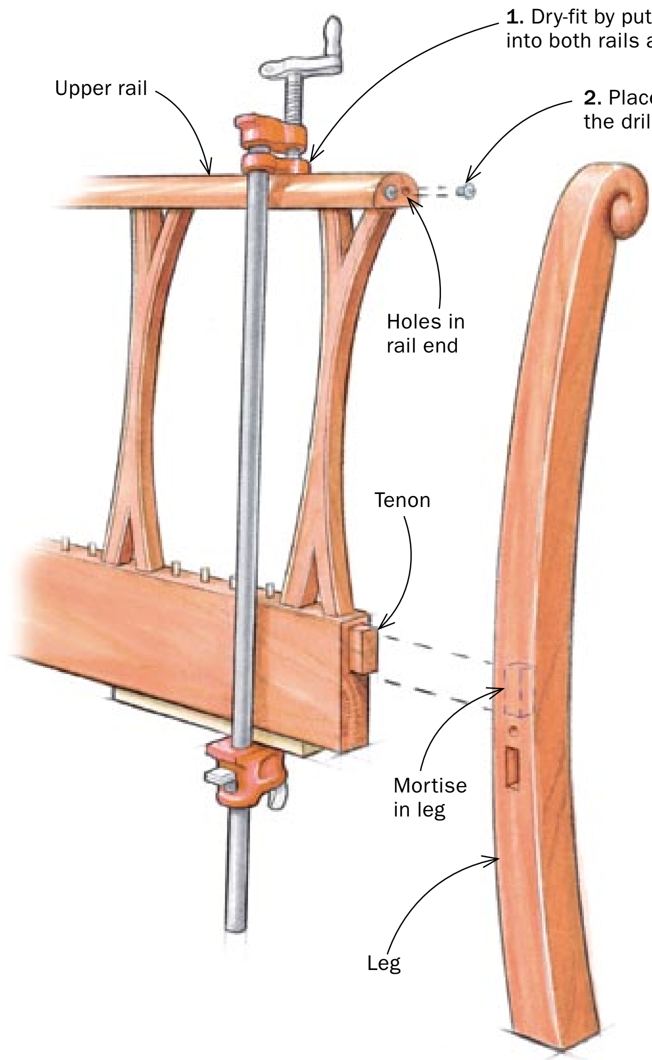
each blank at an 8° angle and then, using a stop block to achieve uniform lengths, cut the same angle on the other end. Before drilling the holes, I lay out the curve on a side of each blank and then make sure that the concave side of the curve is always facing the inside of the jig. This ensures that the pair of 1⁄2-in.-deep holes in each end are angled the correct way.

Now cut the side profile on the bandsaw and clean up the surface using a compass plane or a sander. Lay out the X profile and cut it on the bandsaw, using a spokeshave to smooth the outsides and a chisel or sandpaper to work the insides.

There are a number of ways to bead each X: You can use a beading tool such as one made by Lie-Nielsen; you can make your own scratch stock; or you can use a 3⁄16-in. beading bit in a router attached to a jig (see photo, facing page). Even though you'll need two jigs to match the different profiles for the two groups of Xs, they are simple to make and the beading is done quickly and cleanly. The footboard Xs are beaded on both sides, but the headboard is beaded only on the convex side that faces the bed's interior. Use a chisel to cut a 1⁄8-in. chamfer on the V sections at the end of each X. Finally, sand all the pieces delicately to P320-grit.

The side and cross rails come next

Mill the wood to 1¼-in. thickness and then cut the side rails to length and width. Cut



3. Mark the locations on the leg by placing it onto the lower rail tenon and pressing it into the dowel center points.





Drill the holes in the leg at the drill press.

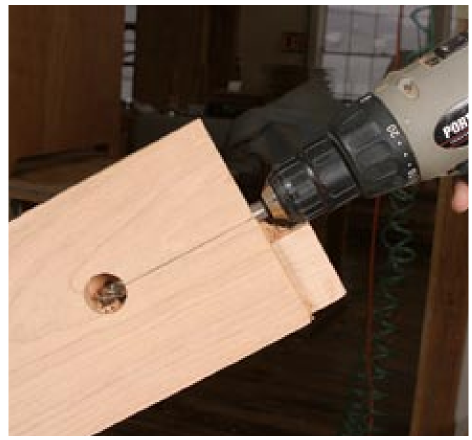
Drill for the bed bolts



Counterbore first. *Use a 1-in.-dia. Forstner bit to create a hole big enough for the head of the bed bolt and the wrench used to tighten it. Follow through with a bit the diameter of the bolt and complete the hole.*



Mark the spot. *Attach the leg to the side rail, place the bolt in the hole drilled in the leg, and use a mallet to mark where to drill the rail.*



Drill down the line. *Use careful layout to drill a hole on the inside of the side rail where the nut will be located; then sight down the layout line to drill in from the end of the side rail and break into the first hole.*

and dry-fit tenons on each end, and put a ⅛-in. roundover on the long edges.

For the lower cross rails, mill the wood to 1⅜ in. thick and cut them to length. Next, cut the tenons, using a tablesaw or a router. Finally, give the long edges a ⅛-in. roundover and sand to P320-grit.

Before the next step, cut the upper cross rails to width and the same length as the lower cross rails minus their tenons. Don't shape the top of the upper rails yet.

Drilling holes for the Xs—The Xs are joined to the upper and lower cross rails with dowels, so the next step is to use a template to mark the location and then drill the holes. Use the plans on pp. 78-79 to make a thin layout template, and space the Xs along the top of the lower cross rail and then along the matching underside of the upper cross rail. Mark off the center of each hole using an awl and then drill each ¼-in.-dia. hole to just over ⅜ in. deep.

Shaping the upper cross rails—After drilling holes on the underside, shape the top sides of these two pieces using a 1-in. roundover bit on the router table or by taking several passes on the tablesaw with the blade at different angles. Then plane by hand to the desired rounded shape. Even though I sand lightly with P320-grit paper after planing, I leave the subtle lines where the handplane has done its work. It leaves a rippled surface that your fingers will reach out to touch each time you pass the bed.

Bed bolts connect the side rails to the legs—Traditional square-headed bed bolts (www.horton-brasses.com; www.woodworker.com), combined with small tenons, are the best way to connect the legs and the side rails, creating a strong joint that can be disassembled to move the bed.

The side-rail and cross-rail tenons are offset so the bolt can pass between them. On a drill press, use a Forstner bit to drill a hole 1 in. dia. by ¾ in. deep. Complete the hole by drilling through the leg with a 7⁄16-in. bit. Dry-fit the leg to the side rail, place the bed bolt in the hole, and use a mallet to imprint the point of the bolt on the end of the rail. Transfer this location along the inside of the rail, calculate the point the tip of the bolt will reach in the rail, and then use the 1-in. Forstner bit to drill a 15⁄16-in.-deep hole at this location.

Using the 7⁄16-in. bit, drill a hole in from the end of the rail from the point marked by the bolt, following the line drawn on the inside of the rail, until you break into the 1-in.-dia. hole. Last, on the side of this hole in the rail nearest the end, create a flat spot for the bed bolt's nut to bear against. Test-fit by connecting the leg to the rail.

Dry-assemble before using glue

With up to 18 Xs and 72 dowels, assembling the head- and footboards requires a dry run and several pairs of hands. Beginning with the headboard, clamp the lower cross rail in a bench vise or onto the benchtop, and dry-assemble with an X at each end and one or two in the middle using ¾-in.-long dowels.

Drill two ⅜-in.-dia. holes about 1⅜ in. deep in each end of the upper cross rail. Place dowel centers in the holes, put the rail on the Xs, attach the legs, and transfer the dowel points onto them. Remove the legs and drill 1⅜-in.-deep holes.

Assemble and finish





Assemble with help. *You'll need a second pair of hands when attaching the upper cross rail and aligning all the dowels with the slats (left). When you are gluing the cross rails to the slats, attach the legs to keep the rails aligned but don't glue them at this time (above). After the rail and slat assembly has dried, remove the legs, apply glue, and clamp in place.*

After a final dry run with all the Xs in place, glue the dowels into both cross rails and attach the Xs. Apply glue to the dowel holes in each X as you attach it. Fit but do not glue the legs, and apply plenty of long clamps between the upper and lower cross rails. Let the headboard dry overnight and then repeat with the footboard.

Final assembly and finishing—With the clamps from the previous step out of the way, you can now glue and clamp the two pairs of legs to their head- and footboards using the tenons on the lower cross rails and the dowels in the upper cross rails.

I finish all of my furniture with two coats of boiled linseed oil, a rubdown with 0000 steel wool, and then paste wax (see "An Oil and Wax Finish," *FWW* #175).

You can use slats to support a mattress, or metal "L" brackets to hold up a box spring. On the queen-size bed, you'll need a wooden crosspiece to support the box spring; the king-size bed has three crosspieces. Finally, with the bed in its final location, attach four brass bolt-hole covers. □

Charles Shackleton owns a furniture-making business in Bridgewater, Vt.



Online Extra

Shackleton wipes on a coat of boiled linseed oil to bring out the warm glow of the cherry. For a step-by-step finishing recipe, go to **FineWoodworking.com/extras.**

JOHN GLENDINNING
Montreal, Que., Canada



Glendinning made this walnut vessel (7 in. deep by 17½ in. wide by 8½ in. tall) from a tree destined for the firewood pile, milling the lumber himself on a chainsaw mill. He steam-bent the segments, and then coopered them before assembling and shaping the vessel by hand. The bowl has an oil finish.

Submissions

Readers Gallery provides design inspiration by showcasing the work of our readers. For consideration, send entry forms (available at www.finewoodworking.com) and photos (unaltered digital images, prints with negatives, or slides) to Readers Gallery, *Fine Woodworking,* 63 S. Main St., Newtown, CT 06470. If you want materials returned, you must include a self-addressed envelope with appropriate postage.



WILLIAM N. MOORE

St. Augustine, Fla.

Moore created this lowboy from the John Townsend original in the Metropolitan Museum of Art in New York City. Because he is a hobbyist woodworker, he says he has the luxury of working on projects "only when the spirit moves" him, so the piece took about five years to make. The primary wood is walnut, with secondary woods of cherry (used for the drawer parts) and poplar. The chest stands 21 in. deep by 37½ in. wide by 36 in. tall and is finished with hand-rubbed tung oil.

ANDREW MAISEL

Missoula, Mont.

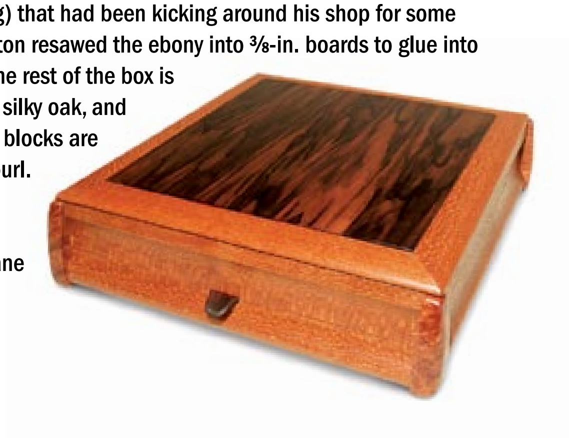
This tall Shaker cupboard (16 in. deep by 66 in. wide by 102 in. tall) was inspired by a Shaker piece built in Massachusetts around 1840. Maisel made it entirely from solid wood, using cherry for the exterior and birch and poplar for the interior. The cherry drawer pulls are ebonized, and the finish is oil and wax.



MARK BRATTON

Visalia, Calif.

Bratton built this jewelry box (17 in. deep by 17 in. wide by 4¾ in. tall) as a Christmas gift for his wife. He designed the box around a small piece of Macassar ebony (3 in. sq. by 14 in. long) that had been kicking around his shop for some time. Bratton resawed the ebony into ⅜-in. boards to glue into a panel. The rest of the box is Australian silky oak, and the corner blocks are redwood burl. The finish is wipe-on polyurethane and wax.





JASON KLAGER
Prince George, B.C., Canada

This rosewood, pear, and imbuya cabinet-on-stand (14 in. deep by 26 in. wide by 44 in. tall) has a slightly concave front and a convex back and sides, with curved glass and pear panels. The doweled cabinet opens on both sides, and the piece is finished with a mixture of equal parts mineral spirits, tung oil, and Waterlox Original. PHOTO: INGABORG SUZANNE





NOAH REITEN
High Falls, N.Y.

Because a large desk can overpower a room, Reiten designed this one (28 in. deep by 76 in. wide by 29 in. tall) to have a lighter feel. He raised the drawer bank and added negative space above it, giving the legs a more slender look. These elements combine so the desk can "sit in a room without taking it over." The bubinga and curly maple desk is finished with an oil/varnish mix, as is the walnut chair.

CRAFTSMAN'S CHALLENGE

Since 2005, Veneer Technologies Inc. has held a juried competition to recognize excellence in woodwork that features veneer. The pieces shown here are a few of the 2007 award winners. To enter this year's competition, go to www.veneertech.com/challenge.



PAUL SCHÜRCH
Santa Barbara, Calif.
GRAND PRIZE WINNER

With decades of marquetry under his belt, Schürch said that this buffet (24½ in. deep by 78 in. wide by 40 in. tall) was a piece of cake, including creating the bow-front shape. The big challenge was working with the unstable pear veneers, he said. Schürch used mahogany for the case, Nigerian satinwood for the ribbon inlay, walnut burl for the borders, and tulipwood banding. A lapis lazuli tack inlaid into the front left foot "holds" the flowing ribbon in place. The finish is conversion varnish. PHOTO: WAYNE McCALL



TRISH McCULLOCH
Toronto, Ont., Canada
HONORABLE MENTION

McCulloch calls this piece a "modern hope chest" because it combines the traditional form with modern design, materials, and techniques. The interior walnut chest is a traditional frame-and-panel construction finished with oil, while the exterior shell is molded curly-maple plywood with a lacquer finish. The bottom is unfinished aromatic cedar. The chest is 20 in. deep by 44 in. wide by 16 in. tall.



DON GREEN
Delhi, N.Y.
HONORABLE MENTION

Green designed this chest of drawers to have a modern look, but his construction methods were traditional. He hand-cut all the dovetails and used mortise-and-tenon and half-lap joinery. The stand is ebonized mahogany, and the chest is sapele and maple. The piece, finished with lacquer, is 21 in. deep by 34 in. wide by 72 in. tall.



KENT TOWNSEND
Salida, Colo.
HONORABLE MENTION

Townsend estimates it took 500 hours to make this Ruhlmann-inspired sideboard (22 in. deep by 60 in. wide by 31 in. tall). He set out to make a difficult piece because he enjoys complicated work; it forces a high level of involvement with his woodworking. The piece is Macassar ebony, with pearwood used in the drawers. The finish is lacquer.



READER SERVICE NO. 135



READER SERVICE NO. 91



READER SERVICE NO. 128

Q&A

‘Over the top’ panel shaping

Q: I recently acquired a 5-hp, 1¼-in. spindle shaper. I intend to make a set of raised panels on it using a very large cutting head, and I am concerned about safety. Is it acceptable to mount the cutter so that the head is above the work and lowered down to make the cut?

—STEVE GLAZIER, Winston-Salem, N.C.

A: IT IS MUCH SAFER IN GENERAL to run the cutter below the table because of the reduced exposure. However, if the finished stock must be a critical thickness, such as a panel edge to fit snugly into the groove in a frame, mounting the cutter above the table is more efficient. By setting the correct distance between the cutter and the table, you guarantee that the thickness of all the panels will be uniform. Unlike router bits, shaper cutters can be installed face up or face down and the rotation can be reversed. Panel cutters are designed to run face down with a typical right-to-left feed (or face up, under the panel, from left to right with the rotation reversed).

For above-the-panel shaping, start by mounting a stock Lexan guard with a center bearing over the cutter. Do not mount a plywood disk or a piece of Lexan or Plexiglas with a hole cut into it directly on top of the cutter. Doing so would turn what was intended to be a guard into a spinning weapon.

I also use a shopmade hold-down that presses the panel flat against the table. There should be enough downward pressure to keep the panel from lifting, but not enough to make it hard to push the panel through. Remember that with the cutter mounted above, catastrophic consequences can occur if the panel should lift up from the table.

For a large, raised-panel cutter, I run the shaper somewhere around 4,000 rpm. I ride my panels on an auxiliary table that has a small clearance around the cutter to prevent the panel from dipping into the table opening.

Back up the stock with a push board. Start by shaping an end-grain side and go around the piece counterclockwise. That way, your final pass will be along the face grain, reducing the likelihood of blowing out the corner details.

One final safety rule: As with all power-tool operations, if you don’t feel comfortable doing this task, don’t do it. Period.

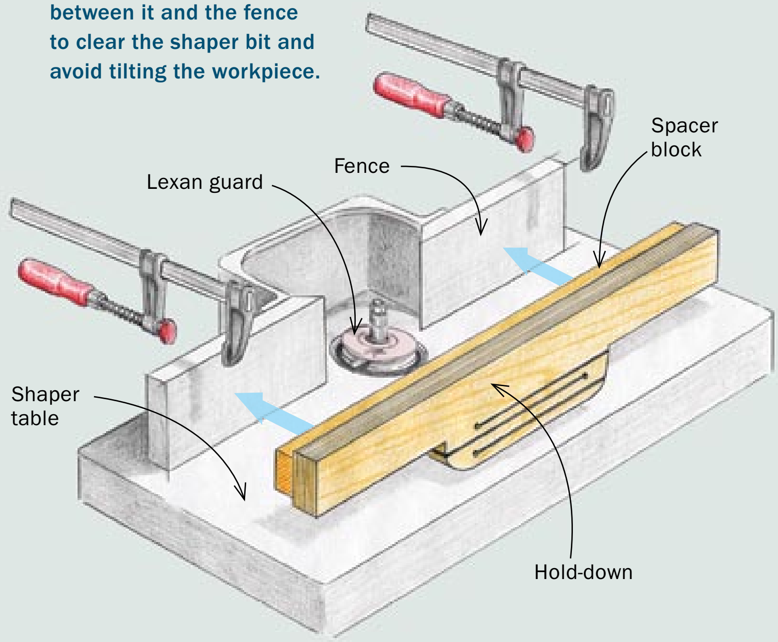
—Steve Latta is a contributing editor.



Don’t shape without the proper guard. *The bearing on this Lexan guard keeps it from spinning with the cutter. A spinning guard can cut or burn you seriously.*

SHOPMADE HOLD-DOWN IS CRUCIAL

Make the hold-down from plywood by drilling and cutting alternating spring cuts. Clamp the hold-down with a spacer block between it and the fence to clear the shaper bit and avoid tilting the workpiece.





Safety first. *With the hold-down against the fence and a piece of scrap serving as a push block, your hands stay far from the cutter. It is safer and you’ll get a cleaner cut by making several shallow passes.*

Ask a question

Do you have a question you’d like us to consider for the column? Send it to Q&A, *Fine Woodworking*, 63 S. Main St., Newtown, CT 06470, or email fwqa@taunton.com.

Photos, this page: Steve Latta; drawings: John Tetreault

Sharpening spokeshave blades



Q: I'm having trouble sharpening my spokeshave blades. The blade from my wooden shave is the wrong shape for my sharpening jig, and the blade from my metal shave is too short for it. Any advice?

—MIKE McDONALD, Belfast, Maine

A: THERE ARE SHARPENING METHODS for both types of blade despite their unusual sizes and shapes.

The drawknife-like blade of a wooden shave has two built-in sharpening aids, the tangs on its sides. Holding both of them, work the back of the blade on a stone. A perfectly flat back isn't critical; in fact, a very small back bevel strengthens the edge and gives a little added control coming out of a cut.

The exact bevel angle isn't critical either (around 20° is fine), but it should be a consistent angle. To achieve this, rest the blade in a shallow "V" groove in a scrap block. Hold one tang, and slide a sharpening stone across the bevel.

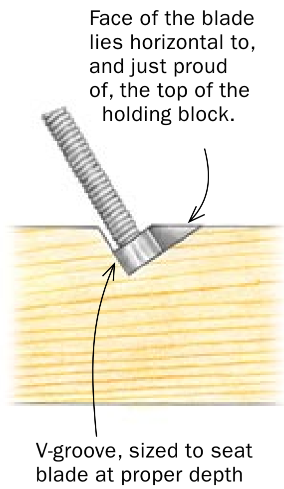
The short blade of a high-angle, cast-iron spokeshave is sharpened as you would any plane blade—at a 25° bevel, with a flat back. Put a slight curve on the edge if you want to use the shave for smoothing.

To use a sharpening jig, tape the blade to the end of a standard plane iron—or to a ¼-in.-thick scrap of wood that's the same size as one. The idea is to "lengthen" the blade so it fits in the jig. Then you can sharpen it as you would a plane iron.

—*Garrett Hack is a contributing editor.*



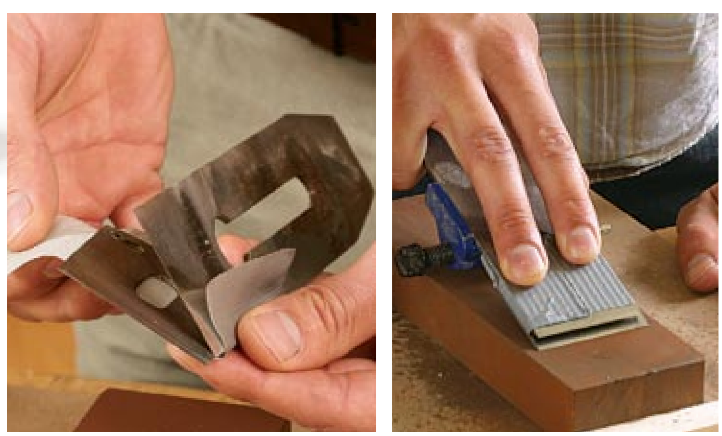
Start with a back rub. *Holding both tangs, rub the back of the low-angle spokeshave blade on a sharpening stone.*





End with help from a holding block. *Fit the blade into a V-groove in a wooden block, and run a sharpening stone over the beveled edge to complete the job.*





Tape two blocks together. *To sharpen the blade of an all-metal spokeshave, begin by taping it just ahead of the front edge of a plane blade, with the bevel facing outward. Place the "elongated" blade into a sharpening jig and work it over a stone as you would a standard plane blade.*

Photos, except where noted: Staff


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How to get around planer snipe

Q: Whenever I run a board through my thickness planer, it winds up with snipe at one or both ends. The infeed and outfeed tables are level with the planer bed. What can I do?

—JIM ASHTON, St. Paul, Minn.



Thinner ends. *Snipe mars the end of a cherry board that's been run through a planer.*

A: THE SIMPLE SOLUTION is to size your workpieces long and then cut off the snipe. Or, you can run strips of wood along the sides of the board being planed. Make the strips at least 1 in. wide and the same thickness as the workpiece. To determine the strips' minimum length, measure the distance between the planer's cutterhead and either of its drive rollers (with the machine unplugged). Add 1 in., multiply by 2, and add that number to the length of your workpiece.

Cut the strips and attach them, centered, to the workpiece sides with glue or brads. If you use brads, make sure they're far enough below the surface to avoid damaging the planer knives.

During planing, the strips reach the cutterhead first, sustaining any snipe, and are held flat under the outfeed roller by the time the workpiece reaches the knives. This virtually eliminates the unsupported lift that causes lead-end snipe. Then, as the board exits, the strips' tail ends are secured by the infeed rollers, keeping the back of the workpiece from tipping up into the cutterhead.

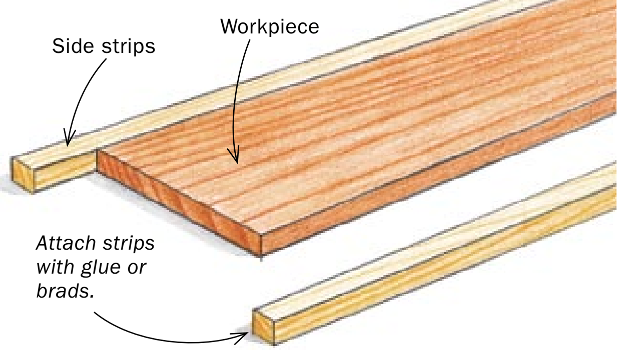
If your board and side strips are less than ¼ in. thick, they could flex and still leave the board with snipe.

—Roland Johnson is a contributing editor.



One way to avoid snipe is with side strips. *Make them the same thickness as the board being planed, but extending beyond both ends. If there's snipe, the strips take it.*

ADD STRIPS OF WOOD TO AVOID SNIPE



Understanding quartersawn figure

Q: After resawing pieces of old, quartersawn oak, I found that some of the boards with rings that were 5° to 10° off perpendicular to the surface showed even better figure than some with fully perpendicular rings. Is there an industry-standard range defining quartersawn? And how important is it to stay within that range when buying oak for its ray-fleck potential?

—JOHN GANSAUER, Moneta, Va.

A: THE NATIONAL HARDWOOD LUMBER ASSOCIATION defines quartersawn wood as having growth rings that are 60° to 90° to the surface. I use that as a starting point when choosing white oak for my Arts and Crafts chairs, but it's not the final word.

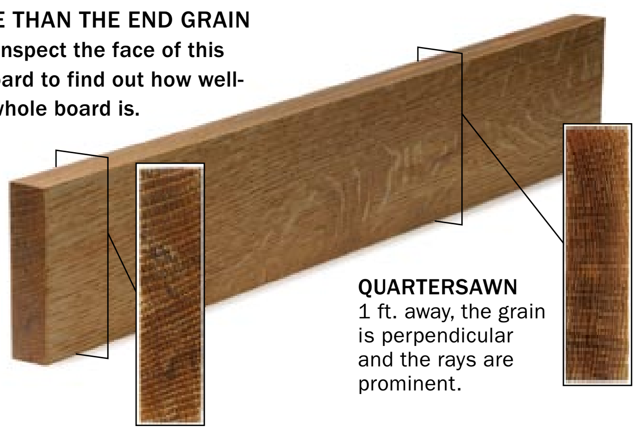
Think of growth rings as undulating waves running the length of a tree, not as rigidly straight structures. (They're essentially a history of the stresses put on the tree as it grew, varying in shape and direction as those stresses came and went.) White-oak rings can be dead-on perpendicular at a board's end but change as much as 10° in just a foot or two. As a result, the figure at the surface of quartersawn wood can change dramatically. I've seen many boards with prominent ray-fleck that peters out, only to return several feet down the board.

When buying quartersawn wood, a better way to determine how good its figure will be is to "read" the surface of the rough-sawn wood, looking for rays all along the board's length. A raking light helps bring out the figure.

—Kevin Rodel makes furniture in Brunswick, Maine.

READ MORE THAN THE END GRAIN

You have to inspect the face of this white-oak board to find out how well-figured the whole board is.





Take a flashlight to the lumberyard. *Raking the beam at a low angle along a board's surfaces might bring out the figure you can't see in overhead light.*



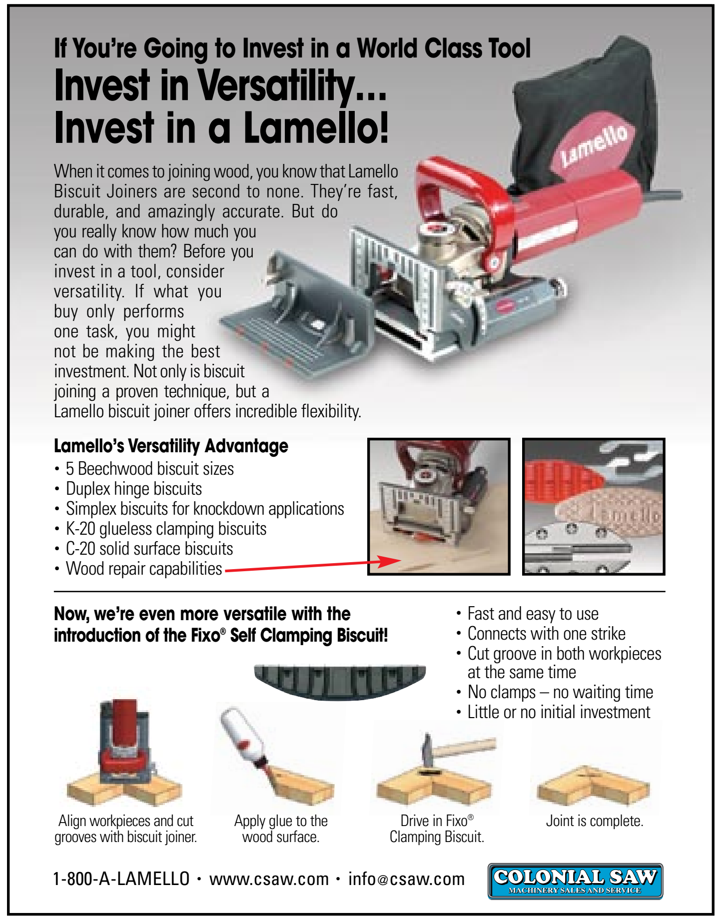
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master class



Sculpt your own hardware

HAVE YOUR WAX DESIGN CAST IN SOLID BRONZE

B Y   H A R O L D   G R E E N E

I began creating my own bronze hardware after I looked in vain through various catalogs for a large, decorative pull for a cabinet that would attach to one door, yet be centered on both doors. The bronze pull I ended up making complemented the piece so perfectly that I've since made dozens of designs using this simple yet creative process.

Working with wax

After drawing front and side elevations of the hardware (in this case two eucalyptus-leaf pulls for the drawers of a desk), I often make wooden mock-ups and use hot-melt glue to attach them in place to get the proportions just right.

I use microcrystalline wax to make my original model. It's readily available from art-supply companies or Amazon.com and usually comes in a 1-lb. to 3-lb. block. Break some off and melt it at around 180°F in a double boiler (the wax is flammable). Pour it into a container formed from aluminum foil that is roughly the shape of the casting. Once the wax hardens, it's ready to carve.

Wood-carving gouges and utility knives are great for roughing out the shape, while a variety of tools including dental instruments are excellent for fine details. Mistakes can be fixed easily by adding hot wax and then reworking the area. You can smooth a rough area by applying a propane torch for a split second, and minor blemishes can

FROM WAX TO BRONZE

There are several methods of casting bronze, the simplest of which is the lost-wax process. Create a design in wax, and then ship it to a foundry. There, the design is dipped in plaster-like slurry, which is baked into a shell. The wax original is melted out and molten bronze poured in to make an exact copy of the original. After the rough casting is returned, you can give it a number of different finishes.



1) CARVE THE WAX ORIGINAL
Melt microcrystalline wax into a rough mold, and then sculpt the design that you want.





2) SEND IT OUT
The piece you get back from the foundry will require filing and cleaning.



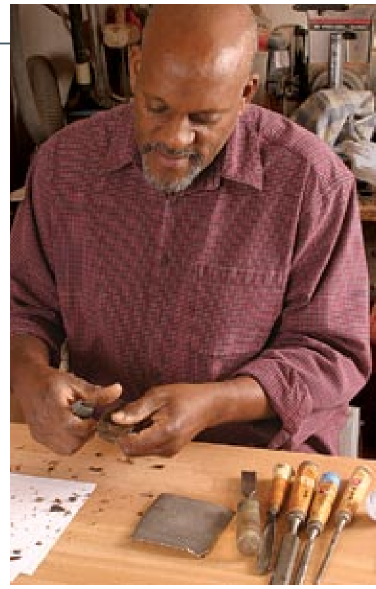
3) CHOOSE A FINISH
You can leave the piece with an antique appearance, or give it a bright polish or a chemically induced patina.

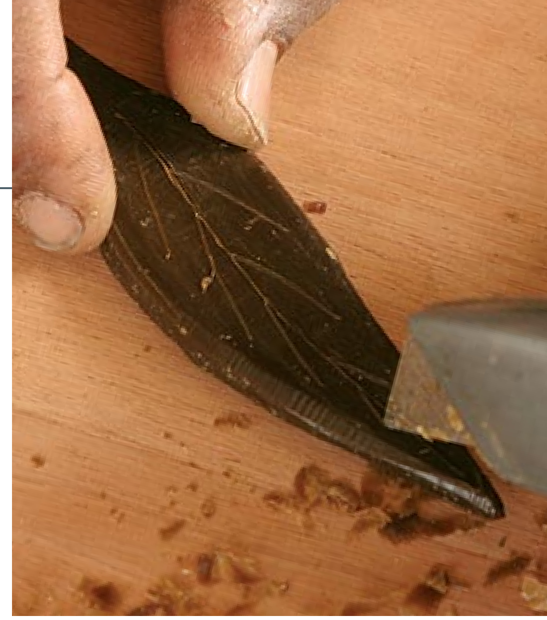
Photos: Mark Schofield

Sculpt the wax



Make the blank. *Melt some wax in a container set in heated water and then pour the wax into a foil form slightly larger than your desired casting.*





Sculpt the shape. *Use a utility knife to shape the outline of the wax original. You can use almost any cutting tool to refine the shape and add details.*

Create a mold of the original



Apply liquid latex. *Use melted wax to stick the originals to Plexiglas, and brush on 10 coats of liquid latex, allowing each coat to dry.*



A plaster cradle. *To create a support for the mold, pour plaster of paris over it and then flatten the top of the plaster with melamine.*



Clean up the mold. *After the plaster dries, remove the original from the mold, and trim any latex overhang before using the mold.*

Make copies and add posts



Pour wax copies. *With the latex mold supported by the plaster cast, pour in liquid wax to create new pairs of leaves.*

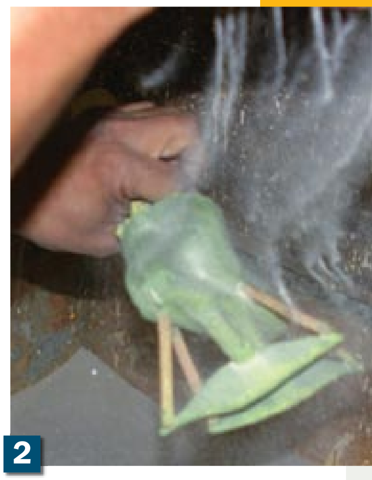




Pour some posts. *To create wax posts for the pulls, seal one end of a piece of copper pipe with masking tape and then pour in some wax (left). Heat the copper to extract the posts. Cut the post material into suitable lengths and attach them to the back of the pulls using hot wax (above).*



1



2

At the foundry

When your wax sculptures get to the foundry, wax rods and pouring cups are attached to ensure that the bronze will be able to flow through the mold. The wax structure is dipped into a green liquid (1), very fine powder is poured over it (2), and then it is hung up to dry. These steps are repeated six or seven times using increasingly coarse sand to build up a ceramic shell. The shell is placed into a steam chamber to melt out the wax, baked in a kiln, and finally has molten bronze at 2,100°F poured into it (3). When the bronze cools, the mold is cracked open (4), the bronze supports are cut away, and the castings are returned to you. You can look for a foundry near you or go to www.theoriginalcastfoundry.com and contact them for an estimate. This pair of leaves cost about $50.



3



4

be removed by rubbing the surface with your warm fingers.

Making multiples of the same design

You could stop here and mail the wax original to the foundry, but even if you only want a single casting, I urge you to make a copy in case the original is damaged or the casting goes wrong. Of course, some pieces, like chests of drawers, require a set of four, six, or eight pulls, and the same number of wax copies.

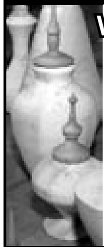
To make a copy you'll need some liquid latex rubber (Mold Builder from www.eti-usa.com) and a piece of Plexiglas or melamine. Attach the wax original to the Plexiglas with melted wax. Make sure there are no voids under the piece.

Brush on a thin coat of latex, making sure no pools form in the crevices. Extend the latex about an inch around the original to form a kind of flange. You want the latex to contact the entire surface of the wax, so use a hair dryer to blow out any bubbles on the wet surface. Let the latex dry until it appears translucent, and then repeat this step nine or 10 times.

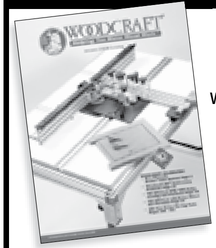
Next, make a support for the mold, which will be quite flexible. Mix up some thick plaster of paris and pour it over the latex mold while it is still attached to the Plexiglas. While the plaster is wet, flatten the top with a piece of melamine or plastic to make a flat bottom for when the mold is flipped over. When the plaster is dry, remove it from the latex, peel the latex mold from the Plexiglas, remove the wax original, and place the mold into the plaster support. Now you can make multiple wax forms.

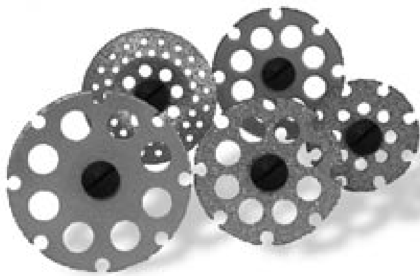
Spray the surface of the mold with silicone lubricant or cooking spray. Then pour some melted wax into the mold. Let the wax cool thoroughly before removing it from the mold. Check the mold for any wax residue, and then repeat the process until you have as many wax copies as you need plus a spare or two.

The final step is to allow for the posts that will be drilled and threaded to connect the pull to the cabinet. I pour melted wax into a section of copper pipe, and when it is hard, heat the outside of the pipe with a propane torch until the wax stick can













Clean up the casting





Clean up the casting. *You'll need to remove the remains of pouring rods attached at the foundry. Use a hacksaw, and then flatten the base of the pull's post on a grinder or with a file.*



Tap a hole. *After drilling a hole in the end of the post, use taps to prepare it for a 10/32 threaded screw that will secure the pull to the drawer front.*

be pushed out. Attach a short section to each pull using melted wax.

Clean up and finish the bronze

When the casting returns from the foundry, you'll need to remove any metal spurs and flatten the ends of the posts using files or a grinding wheel. Then drill and tap the post for a standard 10/32 screw thread.

Now remove the oxidation using steel wool, wire brushes, and fine sandpaper. You can stop at any time, leaving an antique appearance with the recesses still dark, or you can proceed to the buffing wheel and polish the surface to a bright bronze finish and lacquer it.

A third choice is patination, or the enhancement of bronze by the chemical application of color. Two chemicals I use are ferric nitrate to produce reds and browns, and cupric nitrate for greens and blues. You can buy these and find more information on chemical patination at www.sciencecompany.com.

After heating the polished pull with a propane torch, spray 1 tsp. of the chemical diluted in 8 oz. of water onto the hot surface. Continue to alternately heat and spray the surface until you achieve the color you want. After the pull has cooled, buff the surface with 0000 steel wool and then add a coat of paste wax to give it a mellow gloss and protection. □



An antique look. *Use steel wool and fine sandpaper to remove casting oxidation from the pull. Leave some areas dark for an aged look.*



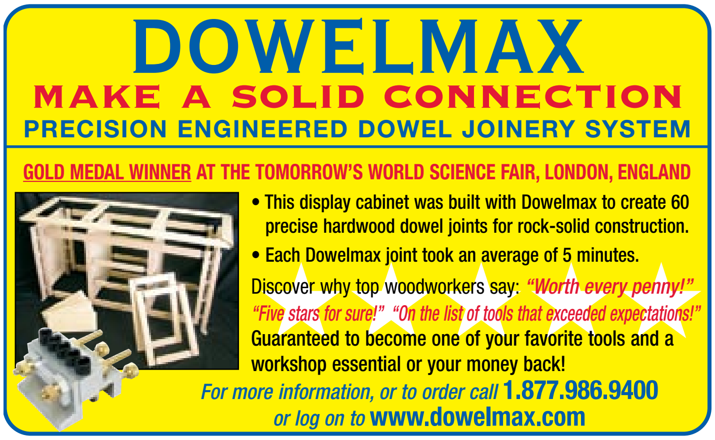
Burnished bronze. *Using compound on a buffing wheel gives the pull a mirror finish.*



A quick patina. *Heating the pull with a propane torch and then spraying on diluted chemicals can give the metal a range of colors.*



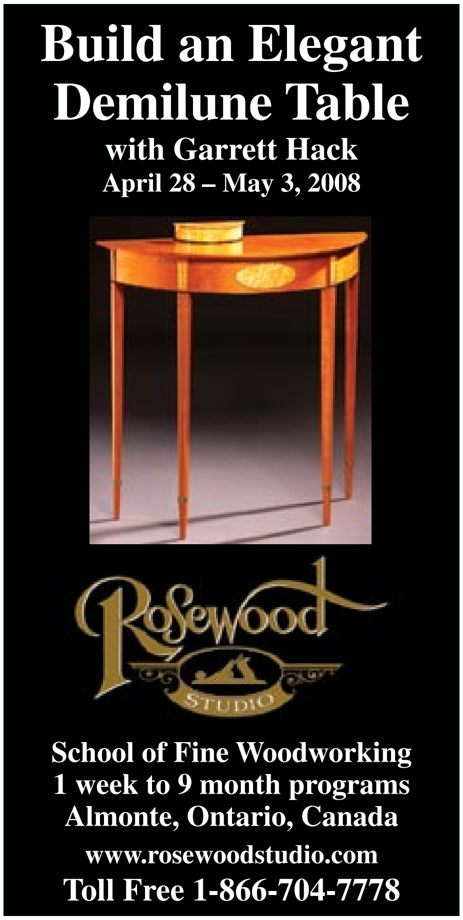
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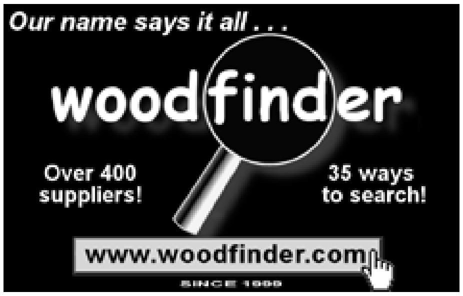
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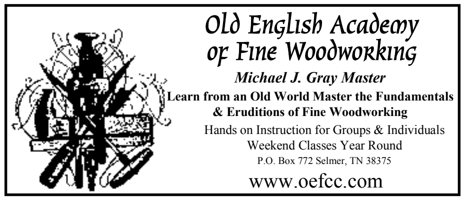








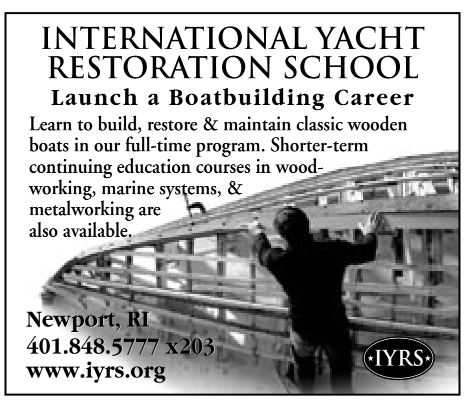




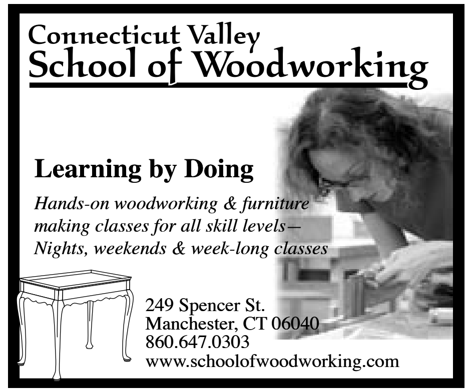


















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how they did it

The carving demystified

BY ANISSA KAPSALES



David Esterly has been carving in the style of 17th-century carver Grinling Gibbons for over 30 years. The key to his carvings (seen on the back cover) lies not in carefully guarded technique, but in the patience and dedication needed to develop a feel for the tools and motion of carving.

In his book *Grinling Gibbons and the Art of Carving* (Harry N. Abrams, 1998), Esterly writes, "The secret of Gibbons's carving is this: there is no secret. The sanctum is empty. What is hidden from view is not any trick of the trade but the carver's midnight struggle with his material."

This is not to say that Esterly's process is devoid of technique. As he shows here, he has developed proven methods for designing, holding workpieces, joinery, and final surface treatment.

One piece at a time





Tabs are small handles. *The tabs allow each delicate piece to be raised, flipped, and clamped onto blocks (above), permitting the carver to attack the grain from different angles and undercut the backs for clearance. Once the carving is finished, Esterly cuts off the tabs with a chisel (right) or bandsaw.*

Many become one





Locate for dowels. *Esterly slides the head of a sewing pin between two adjacent pieces (left). Then he presses the pieces together to mark them simultaneously for their mating dowel holes (right).*





Drill the dowel holes. *Using the imprint of the pinhead as a center point, Esterly drills holes for the dowels (left), ranging from 1⁄8 in. to 1⁄4 in., depending on the size of the items. He uses white glue to secure the dowels and join the pieces (right).*

The final touch



17th-century sandpaper. *Esterly discovered that Gibbons used Dutch rush, a leafless, bamboo-like plant, to surface his carvings. Esterly stuck with the method because the result offers texture and character that sandpaper cannot match.*

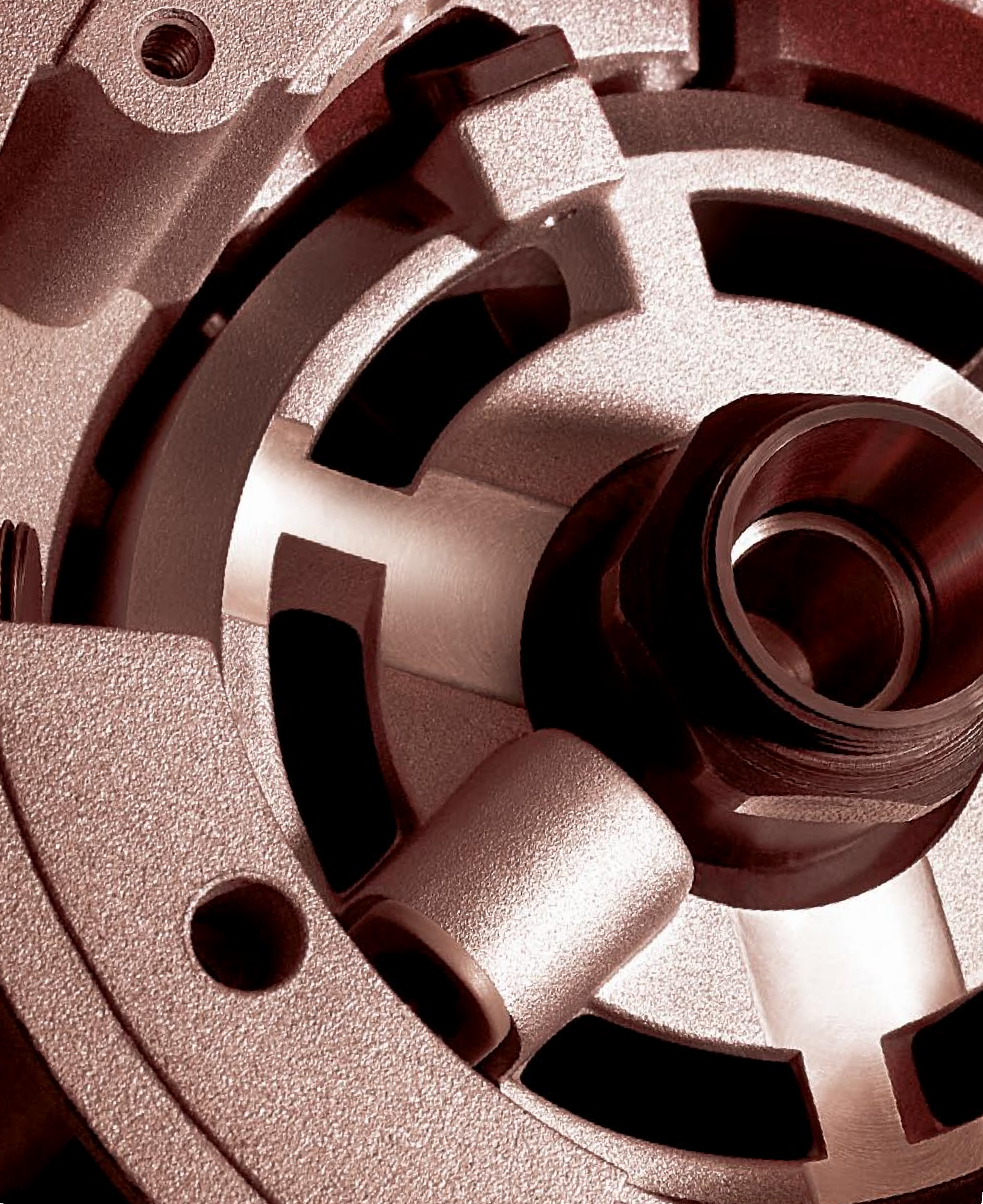
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A Vision in White

While studying literature in England in the 1970s, David Esterly walked into a London church and had "a sort of conversion experience." It wasn't the liturgy that moved him, but the deep-relief floral altarpiece carved in limewood by 17th-century master Grinling Gibbons.

Esterly's first impulse was to write a book about Gibbons. To better understand the carving, he bought limewood and chisels and began trying it. Esterly had always assumed he had no artistic aptitude, but inching along by trial and error he was soon so deeply immersed in carving that he abandoned the book. And before long, without a day's instruction, he was making his living as a carver.

In the decades since, he has dedicated himself to the astonishingly deep, detailed, and delicate style that Gibbons pioneered. Now living in upstate New York, Esterly carves all his pieces, as Gibbons did, from European linden, or limewood—a cousin of American basswood but better for this sort of carving—and leaves them without finish. In 1998, Esterly returned to London to curate the Gibbons exhibition at the renowned Victoria and Albert Museum—and he wrote the accompanying book.

—Jonathan Binzen



Photos: David Esterly

How They Did It Turn to p. 108 for an inside look at Esterly's carving techniques.

Pro Portfolio For a narrated slide show of Esterly's work, go to FineWoodworking.com/extras.